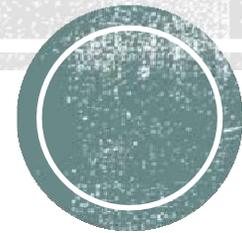


HOW TO CONDUCT THE LITERATURE SEARCH?



IMPORTANCE OF THE LITERATURE SEARCH

on the
computer

"Two hours in the ~~library~~ can save six months in the laboratory"



IMPORTANCE OF THE LITERATURE SEARCH

- ❖ Identify the framework of the research,
- ❖ Up-to-date overview and information about the topic being studied,
- ❖ Show the importance & originality of the research,
- ❖ The quality of literature review and your final work depends on the quality of literature survey/search,
- ❖ Find how to conduct the research,
- ❖ Provides to find or design possible new researches,
- ❖ Eliminates the previous methods that did not work-enables save your time.



FORMER TIME-LITERATURE SEARCH

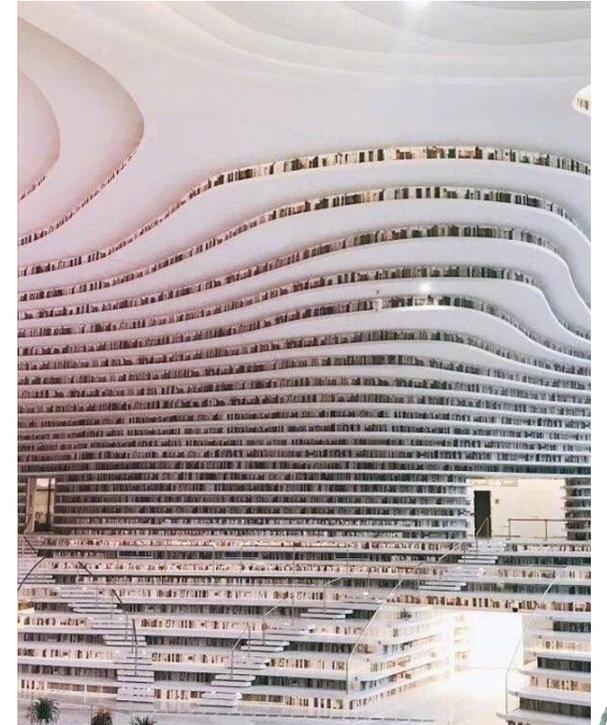
Step 1. Go to the library



Step 2. Search the database of the library



Step 3. Find the source



NOWADAYS-LITERATURE SEARCH



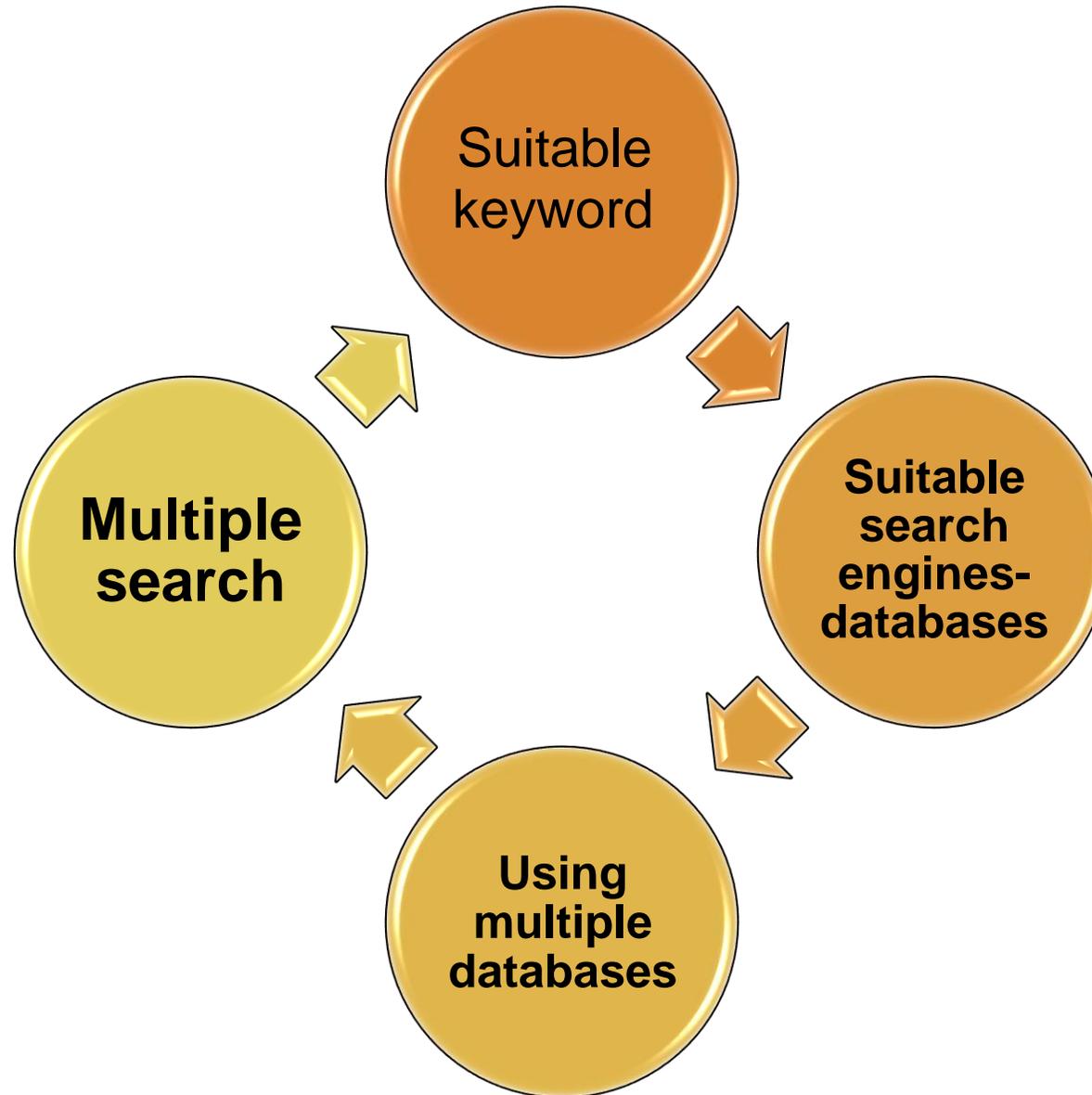
<https://www.researchgate.net/>

<https://www.webofscience.com/wos/woscc/basic-search>

https://www.elsevier.com/solutions/sciencedirect?dgcid=RN_AGCM_Sourced_300006409&gclid=Cj0KCQjw-fmZBhDt



HINT FOR QUALITY SEARCH



HINT FOR QUALITY SEARCH

For a specific term use “...” eg. “gel casting ceramics”

For multiple terms use and eg. Flexure and ceramic

For different terms use + + + eg. +glass+melting+furnace

If you want to remove one term in your search use + - - eg.
+nanofabrication-solidification



CLASSIFICATION OF SOURCES

Primary literature (sources)

- Scientific research papers-articles
 - (original articles, case reports, technical notes, pictorial essays, reviews, commentaries and editorials)
- Books
- Proceedinds
 - (Studies presented in any scientific meeting)
- Thesis and scientific reports
- Patents



CLASSIFICATION OF SOURCES

Secondary literature (sources)

- Review papers-articles
 - (original articles, case reports, technical notes, pictorial essays, reviews, commentaries and editorials)
- Databases give the abstract of the study



CLASSIFICATION OF SOURCES

Ternary literature (sources)

- *Dictionary, encyclopedia*
- *Guides*
- *Lecture notes*



BE AWARE OF THESE SOURCES

- **Internet** (Web-site should be reliable and experience is necessary)
- **Newspaper** (No intention for scientific studies)
- **Popular scientific magazines** (Lacking of original study, profit motive establishment)
- **Unpublished or informally published work** (Gray literature)



SOURCES/DATABASES

AYBU-Library

https://www.aybu.edu.tr/kutuphane/content_detail-257-1817-ankara-yildirim-beyazit-universitesi-2020

Lecture Notes - MEC2... Nanotechnology and ... nanomaterials nobel p... Arduino Kart ile Karan... Differential Scanning ... Crystallography Open ... Journal of Material Cy... Lecture Notes - MEC2... Diğ er yer iml

f t v i | Tr Eng

Yıldırım Beyazıt Üniversitesi
Bilgi ve Dokümantasyon Daire Başkanlığı

HAKKIMIZDA KYS KÜTÜPHANE HESABIM ARAŞTIRMA HİZMETLER E-KAYNAKLAR AYBÜ YAYINLARI İLETİŞİM



VERİ TABANLARI VERİS/UZAKTAN ERİŞİM AÇIK ERİŞİM İNTEHAL PROGRAMLARI UPTÖDATE MOBİL CEP KÜTÜPHANEM ORCID

TÜMÜ KATALOG E-DERGİLER ProQuest

Ara

Kütüphanemizdeki tüm kaynakları arayın

Gelişmiş Arama Yardım Veritabanları Kampüs Dışı Erişim

SOURCES/DATABASES

Science Direct

← → ↻ 🏠 <https://www.sciencedirect.com> ☆ 📧 📱

⚙️ En çok ziyaret edilenler 🌐 Lecture Notes - MEC2... 🌐 Nanotechnology and ... 🌐 nanomaterials nobel p... 🌐 Arduino Kart ile Karanl... 🌐 Differential Scanning ... 🌐 Crystallography Open ... 🌐 Journal of Material Cy... 🌐 Lecture Notes - MEC2... >> 📁 Diğer yer imle

 ScienceDirect® Journals & Books ⓘ  

Search for peer-reviewed journal articles and book chapters (including [open access](#) content)

 [Advanced search](#)

Elsevier journals offer the latest peer-reviewed research papers on climate change, biodiversity, renewable energy and other topics addressing our planet's climate emergency. Join us in working towards a sustainable future with our editorially independent report on creating a Net Zero future.

[Get the Net Zero report](#)

Explore scientific, technical, and medical research on ScienceDirect

SOURCES/DATABASES

Elsevier

← → ↻ 🏠 https://www.elsevier.com/research-intelligence/societal-impact-research-with-scopus?dgcid=RN_AG_Sourced_400002260&gclid=EAIaIQobChMI2bvQjYTF-gIVGe 📄 ☆ 📧 📱

⚙️ En çok ziyaret edilenler 📄 Lecture Notes - MEC2... 🌐 Nanotechnology and ... 🌐 nanomaterials nobel p... 🌐 Arduino Kart ile Karan... 🌐 Differential Scanning ... 🌐 Crystallography Open ... 🌐 Journal of Material Cy... 📄 Lecture Notes - MEC2... >> 📄 Diğer yer imle



ELSEVIER

[About Elsevier](#)

[Products & Solutions](#)

[Services](#)

[Shop & Discover](#)



[Home](#) > [Research Intelligence](#) > [Societal impact research with Scopus](#)

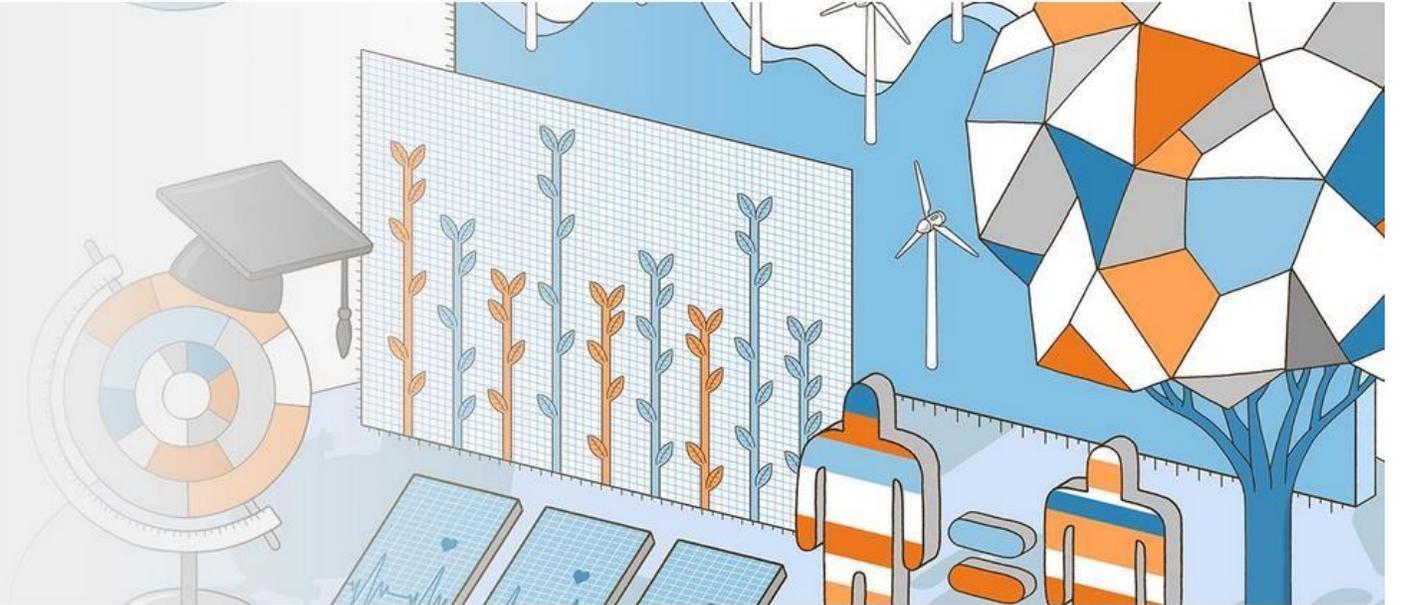
Scopus®

Analyze & understand societal impact research with Scopus

A closer look for research leaders

Updated: August 25, 2021

[Request a consultation >](#)



[Your role in societal impact](#)

[Your research through SDGs lens](#)

[Analyze search results in Scopus](#)

What is your university's role in Societal Impact?

Increasingly, university leadership, governments, funders, the community, and more are demanding to understand the value of a university's research. They want to know that the significant investment into research is going to

SOURCES/DATABASES

Wiley



Wiley Online Library



[Login / Register](#)

Accelerating research discovery to shape a better future

Today's research, tomorrow's innovation

Search publications, articles, keywords, etc.



[Advanced Search](#)

1,600+ Journals

250+ Reference Works

22,000+ Online Books

Resources

Researchers

[Register online](#)

[Access options](#)

[Find training and resources](#)

Librarians

[Manage your account](#)

[View products and solutions](#)

[Find training and support](#)

Societies

[Publish with Wiley](#)

[Learn about trends](#)

[Subscribe to news and resources](#)

Authors

[Submit a paper](#)

[Track your article](#)

[Learn about Open Access](#)

SOURCES/DATABASES

Patent Search

← → ↻ 🏠 <https://worldwide.espacenet.com/patent/search?q='silicon nitride'> ☆ 📧 📄 ☰

⚙️ En çok ziyaret edilenler 🌐 Lecture Notes - MEC2... 🌐 Nanotechnology and ... 🌐 nanomaterials nobel p... 🌐 Arduino Kart ile Karan... 🌐 Differential Scanning ... 🌐 Crystallography Open ... 🌐 Journal of Material Cy... 🌐 Lecture Notes - MEC2... >> 📁 Diğer yer imleri

 **Espacenet**
Patent search

"silicon nitride" 🔍 Office/Language ▾

My Espacenet Help Classification search Results Advanced search Filters Popup tips [Feedback](#)

Home > Results

576 522 results found

List view: Text only | List content: All | Sort by: Relevance

(0 patents selected) **Select the first 20 results**

1. MANUFACTURE OF SILICON NITRIDE
CA120505A • 1909-09-14 • SINDING-LARSEN ALF [NO]
Earliest priority: 1909-02-23 • Earliest publication: 1909-09-14
No abstract available

2. METHOD AND COMPOSITIONS FOR DIRECT COPPER PLATING AND FILLING TO ...
CA2643018A1 (C) • 2007-08-30 • ALCHIMER [FR]
Earliest priority: 2006-02-21 • Earliest publication: 2007-08-30
The object of the present invention is a method and compositions for direct copper plating and filling to form interconnects in the fabrication of semiconductor devices. According to the invention, this method comprises : providing an electrolytic copper bath containing, in solution in a solvent, a source of copper ions with a concentration

3. Re-usable silicon nitride ceramic crucible useful for preparing mono or multi-crystalline ...
DE102012101214A1 (B4) • 2013-08-22 • FRAUNHOFER GES FORSCHUNG [DE]
Earliest priority: 2012-02-15 • Earliest publication: 2013-08-22
The re-usable silicon nitride ceramic crucible comprises an oxygen-enriched surface layer, which is formed by

SOURCES/DATABASES

YÖK-Thesis

https://tez.yok.gov.tr/UlusalTezMerkezi/giris.jsp

Yükseköğretim Kurulu Başkanlığı
Tez Merkezi

Üye Girişi

Ana Sayfa Tarama Mevzuat İstatistikler SSS Yasal Uyarı Bize Ulaşın Yardım YÜKSEK ÖĞRETİM DERGİSİ Yeni YÖK Projesi

Tarama terimi giriniz

Aranacak Alan Tez Adı İzin Durumu Tümü Tez Türü Tümü Temizle Bul

Detaylı Tarama | Gelişmiş Tarama | Son Eklenen Tezler

ARAŞTIRMACILARIN DİKKATİNE

- Ulusal Tez Merkezi hizmetlerinin tamamı internet üzerinden verilmektedir.
- Yazarları tarafından Yükseköğretim Kurulu Ulusal Tez Merkezi Veri Tabanında arşivlenmesine ve internet üzerinden tam metin erişime açılmasına izin verilen tezler açık erişime sunulmaktadır.
- Yasal uyarıyı okumak için [tıklayınız](#).
- Tez Merkezi veri tabanında yayınlanma izni olmayan tezlerin basılı kopyalarına Üniversite kütüphaneleri aracılığıyla (TÜBESS üzerinden) erişebilirsiniz.
- Tez Veri Giriş Formunu doldurmak için, sisteme e-Devlet ile giriş yapmak gerekmektedir. E-Devlet girişi yapmak için [tıklayınız](#).
- 2006 yılı öncesi tezlerden erişime kapalı olanların yazarları "Tez Yayımlama İzin Belgesi"ni doldurarak tezlerini tam metin erişime açabilirler.
- İnternet sitemizi en iyi şekilde görüntüleyebilmek için Google Chrome ya da Mozilla Firefox tarayıcısını kullanmanızı öneririz.

İLETİŞİM

Adres Yükseköğretim Kurulu Yayın ve Dokümantasyon Daire Başkanlığı Ulusal Tez Merkezi / 06539 Bilkent - Ankara

Okuyucu Hizmetleri Telefon: 0 312 298 73 81/ Faks: 0 312 298 74 53

E-posta dokuman@yok.gov.tr

E-SOURCES/DATABASES

TR Dizin

← → ↻ 🏠 <https://trdizin.gov.tr> ☆  ☰

⚙️ En çok ziyaret edilenler 📄 Lecture Notes - MEC2... 🌐 Nanotechnology and ... 🌐 nanomaterials nobel p... 🌐 Arduino Kart ile Karanl... 🌐 Differential Scanning ... 🌐 Crystallography Open ... 🌐 Journal of Material Cy... 📄 Lecture Notes - MEC2... >> 📁 Diğer yer imleri

☎️ +90 (312) 298 92 00 ✉️ trdizin@tubitak.gov.tr 🏠 Giriş Yap



🔍 Site Search



Anasayfa

Hakkında

Kriterler

Dergi Listesi

Toplantılar

Rehber

Yardım

İletişim

Yayın Arama

Dergi Arama

Yazar Arama

TR Dizin'de yayın ara... Ör: Yapılandırmacılık

İfade, bulanık, yakınlık araması ve daha fazla gelişmiş arama örnekleri



TR Dizin web sitesi, deneyiminizi geliştirmek için çerezleri kullanır. TR Dizin sitesini kullanarak Veri Koruma Politikamızı kabul etmiş olursunuz.

[Gizlilik ilkelerini oku](#)

[Kabul Et](#)



ÜAK Doçentlik Başvurularında Kurul Üniversitelerarası Kurul Başvurularında Yer Alan taranan ulusal hakemli dergiler

TR Dizin Tanıtım Etkinliği Düzenlenecektir



SOURCES/DATABASES

BOREN



SİTE HARİTASI

RSS



arama...



Anasayfa

Kurumsal

Bor

Çalışma Alanları

Projeler

Laboratuvarlar

İletişim

BOR DERGİSİ
JOURNAL OF BORON'UN
SON SAYISI YAYINLANDI!

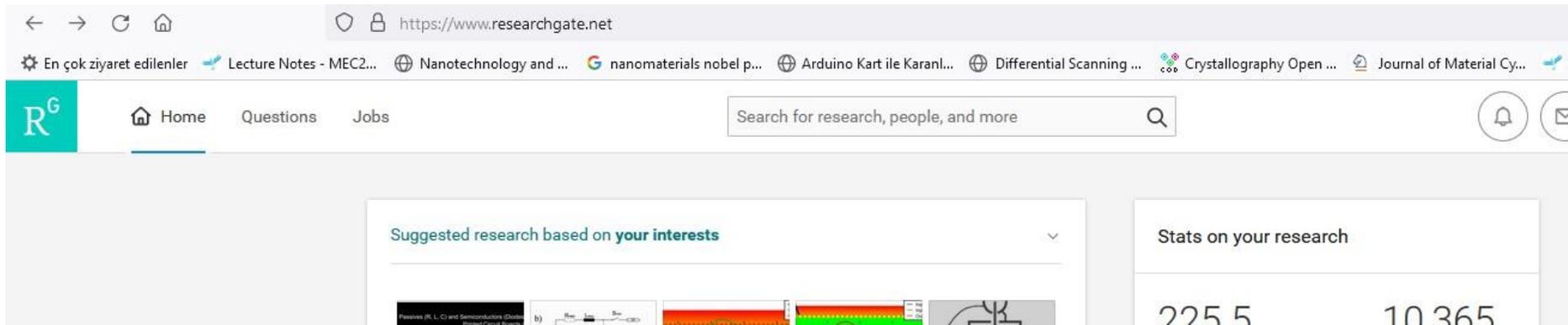
Bor Dergisi Journal Of BORON Yayınlandı

HABERLER

- BORON 2022 Sempozyumu 5-7 Ekim 2022 tarihlerinde İstanbul Teknik Üniversitesi Süleyman Demirel Kongre Merkezinde Gerçekleşti
- BORON2022 Uluslararası Bor Sempozyumu
- TENMAK BORON2022 Uluslararası Bor Sempozyumu Düzenliyor
- VI. TENMAK BOREN Proje Günleri Gerçekleştirildi
- TENMAK'ın Katkıları ve YÖK'ün Desteğiyle Eti Maden İşletmeleri Genel Müdürlüğü'nün Ev Sahipliğinde 'BOR ÇALIŞTAYI' Düzenlendi
- Bor Dergisi Journal Of BORON Yayınlandı

E-SOURCES/DATABASES

RESEARCHGATE



The screenshot shows the ResearchGate website interface. At the top, there is a navigation bar with the ResearchGate logo (R^G) and links for Home, Questions, and Jobs. A search bar is present with the placeholder text "Search for research, people, and more". Below the navigation bar, there are two main sections: "Suggested research based on your interests" and "Stats on your research". The "Suggested research" section displays a list of research items, including one titled "Research of L, Cr and Semiconductors (Doping)". The "Stats on your research" section shows two statistics: 2255 and 10365.

**YOU CAN CREATE AN ACCOUNT BUT
DO NOT ADD YOUR THESIS
WITHOUT THE PERMISSION OF
YOUR ADVISOR!!!!!!!**

stainless steel

Article October 2022 · Corrosion Science · 18 Reads

Applications Scientist SEM-
Dualbeam (Semiconductor)
Thermo Fisher Scientific



E-SOURCES/DATABASES

← → ↻ 🏠 https://scholar.google.com.tr/scholar?q=scholar&hl=tr&as_sdt=0&as_vis=1&oi=scholar

⚙️ En çok ziyaret edilenler 📄 Lecture Notes - MEC2... 🌐 Nanotechnology and ... 📄 nanomaterials nobel p... 📄 Arduino Kart ile Karanl... 📄 Differential Scanning ... 📄 Crystallography Open ... 📄 Journal o

☰ Google Akademik 🔍

📁 Makaleler Yaklaşık 9.000.000 sonuç bulundu (0,03 sn)

Tüm zamanlar
2022 yılından beri
2021 yılından beri
2018 yılından beri
Özel aralık...

Alakaya göre sırala
Tarihe göre sırala

Herhangi bir dil
Türkçe sayfalarda ara

Tüm türler
Makaleleri incele

patentleri içer
 alıntılar

Uyan oluşturun

[HTML] Google Scholar: the pros and the cons
P Jaccsó - Online information review, 2005 - emerald.com
... Google **Scholar** goes beyond information discovery by leading qualifying users at ... On the negative side, the most important problem is that the crawlers of Google **Scholar** have not ...
☆ Kaydet 📄 Alıntı yap Alıntılanma sayısı: 564 İlgili makaleler 10 sürümün hepsi Web of Science: 208 📄

[HTML] emerald.com
Full View

[HTML] Google scholar
R Vine - Journal of the Medical Library Association, 2006 - ncbi.nlm.nih.gov
... Because so much of the content of Google **Scholar's** index comes from licensed commercial journal content, most users will discover that clicking on a link in Google **Scholar's** search ...
☆ Kaydet 📄 Alıntı yap Alıntılanma sayısı: 142 İlgili makaleler 5 sürümün hepsi

[HTML] nih.gov
FullText@YilBeyazitUniLib

The american scholar
RW Emerson - Handbook of Research on Teacher Education, 2008 - api.taylorfrancis.com
Mr. President and Gentlemen, I greet you on the re-commencement of our literary year. Our anniversary is one of hope, and, perhaps, not enough of labor. We do not meet for games of ...
☆ Kaydet 📄 Alıntı yap Alıntılanma sayısı: 408 İlgili makaleler 2 sürümün hepsi 📄

[PDF] academia.edu

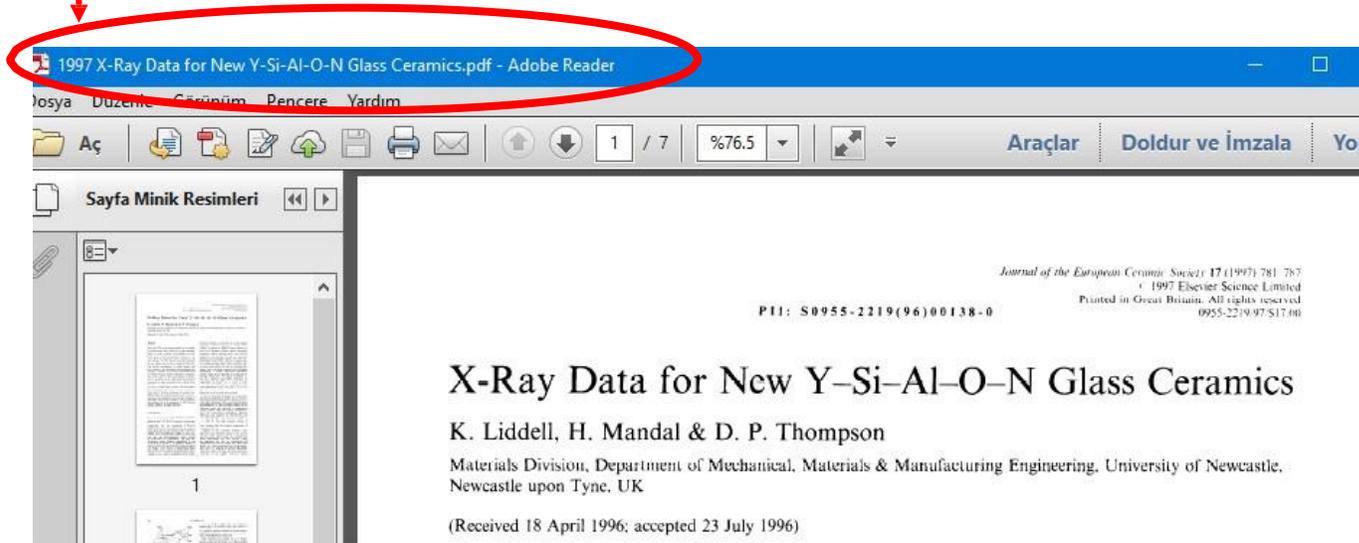
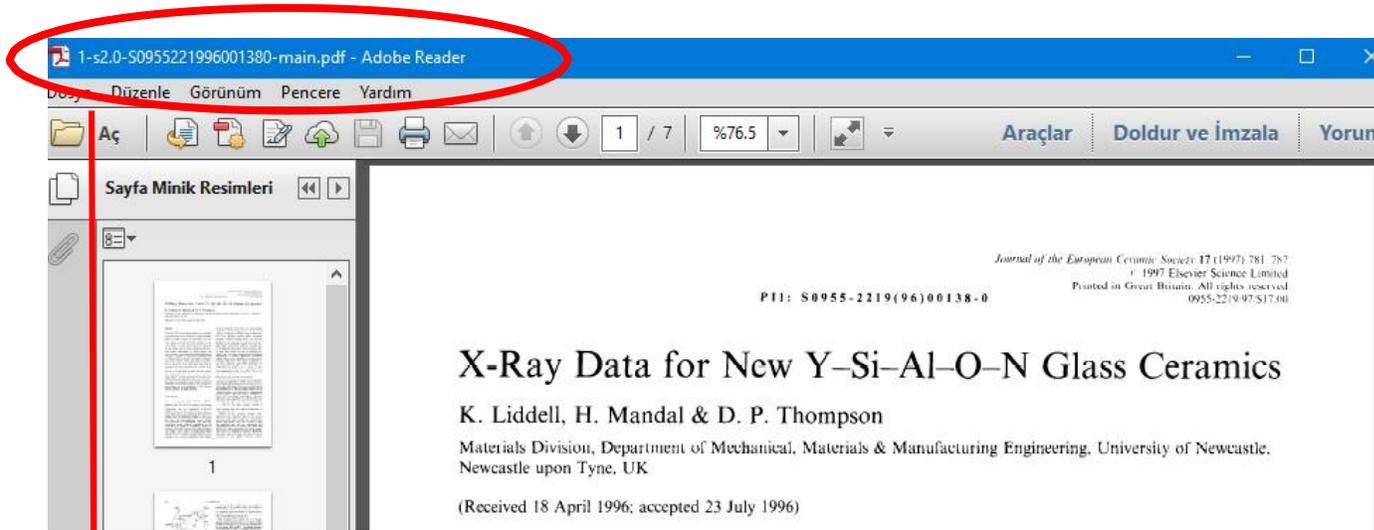
Google scholar revisited
P Jaccsó - Online information review, 2008 - emerald.com
The Google Books project has given a massive and valuable boost to the already rich and diverse content of Google **Scholar**. The downside of the growth is that significant gaps remain ...
☆ Kaydet 📄 Alıntı yap Alıntılanma sayısı: 286 İlgili makaleler 10 sürümün hepsi Web of Science: 109

[PDF] unibo.it
FullText@YilBeyazitUniLib

[KİTAP] The American Scholar
RW Emerson - 2020 - books.google.com
I greet you on the re-commencement of our literary year. Our anniversary is one of hope, and, perhaps, not enough of labor. We do not meet for games of strength or skill, for the ...

[PDF] public-library.uk





MSE 411 GRADUATION PROJECT

Results and Discussion

M.F.Öktem

Results and Discussion

Discussion and Results section of a paper/research report is composed of two sections:

- Results of your main/important findings
- Comparison of your results with other studies

In that sense;

You can give specimen data, info on how you conduct the analyses/testing/experimentation in the method section but the output (results) should be given in the Results/Discussion section.

Results and Discussion

- This section gives you the limitations of your research
- What are the contributions of your study to the literature in the field?
- Gives keys to other researchers in the subject of the paper

Results and Discussion

How to Organize This Section?

- Results and Discussion section follows Methods and Materials section
So it should give the outputs (results) of the Methods and Materials section
- In research papers, this section is expected to give more information than Methods and Materials section based on the obtained and processed data (not only raw data).
So expect more pages of this section than Methods and Materials section!

Results and Discussion

How to Organize This Section?

- Organize your research data based on how important those are in relation to your research. This section should focus on showing major results that support or reject your research hypothesis.

Reference: <https://goldbio.com/articles/article/Guide-to-results-and-discussion-section>

Results and Discussion

How to Organize This Section?

- You can prioritize your research data based on importance – focusing heavily on the information that directly relates to your research questions using the subheadings. The organization of the subheadings for the results section usually mirrors the methods section. It should follow a logical and chronological order.

Results and Discussion

How to Organize This Section?

Subheadings

- Subheadings within your results section are primarily going to detail major findings within each important experiment. And the first paragraph of your results section should be dedicated to your main findings (findings that answer your overall research question and lead to your conclusion)

Results and Discussion

How to Organize This Section?

Subheadings

Each subheading may contain:

Text: to explain about the research data

Figures: to display the research data and to show trends or relationships, for examples using graphs or pictures

Tables: to represent a large data and exact value

Results and Discussion

How to Organize the Discussion Section

In the discussion part, you should compare your results with the literature data. It is not only comparing but strengthens your hand. Proves you are getting accurate data!

Results and Discussion

How to Organize the Discussion Section

Based on your findings, you defend the answers to your research questions and create arguments to support your conclusions.

Below is a list of questions to guide you when organizing the structure of your discussion section:

Results and Discussion

How to Organize the Discussion Section

What experiments did you conduct and what were the results?

What do the results mean?

What were the important results from your study?

How did the results answer your research questions?

Did your results support your hypothesis or reject your hypothesis?

What are the variables or factors that might affect your results?

What were the strengths and limitations of your study?

What other published works support your findings?

What other published works contradict your findings?

What possible factors might cause your findings different from other findings?

What is the significance of your research?

What are new research questions to explore based on your findings?

Results and Discussion

How to Organize the Discussion Section

Organizing the Discussion Section

The structure of the discussion section may be different from one paper to another, but it commonly has a beginning, middle-, and end- to the section.

The beginning: The first sentence of the first paragraph should state the importance and the new findings of your research. The first paragraph may also include answers to your research questions mentioned in your introduction section.

Results and Discussion

How to Organize the Discussion Section

Organizing the Discussion Section

The middle: The middle should contain the interpretations of the results to defend your answers, the strength of the study, the limitations of the study, and an update literature review that validates your findings.

The end: The end concludes the study and the significance of your research

Creating an Effective Academic Poster

Dr. Furkan Özdemir

Tips for Designing Effective Presentations

A poster with the main title in 1 1/2" sans serif

Developed by D. Shong, C. Dwyer, M. Kelly, K. Inman, and K. Wink
with materials obtained by Penn State's Education Technology Services

Get the audience's attention and communicate your message quickly and succinctly.



Use photos and images wisely. They're a valuable way to illustrate important concepts, identify relationships, and bring in statistics.

Choosing and Using Color



Use color to draw attention to key points. It can also be used to highlight important information. Use color to draw attention to key points. It can also be used to highlight important information. Use color to draw attention to key points. It can also be used to highlight important information.

Using Images



Use meaningful, high-quality images. Appropriate and relevant images help to illustrate concepts, identify relationships, and bring in statistics. Use photos and images wisely. They're a valuable way to illustrate important concepts, identify relationships, and bring in statistics.

Developing a Layout

The main message (title) goes first. Use a grid to organize, spaced out images.

Use a color scheme. Use a color scheme.

Use a clear layout. Use a clear layout.

Planning

Use a grid. Use a grid.

Use a color scheme. Use a color scheme.

Scrubbing Fonts and Using Text



Use a sans serif font. Use a sans serif font.

Use a clear layout. Use a clear layout.

Judges Checklist

1. Title of the poster
2. Author's name
3. Introduction, objectives, and importance
4. Background information
5. Methods
6. Results
7. Conclusions
8. Acknowledgments
9. References

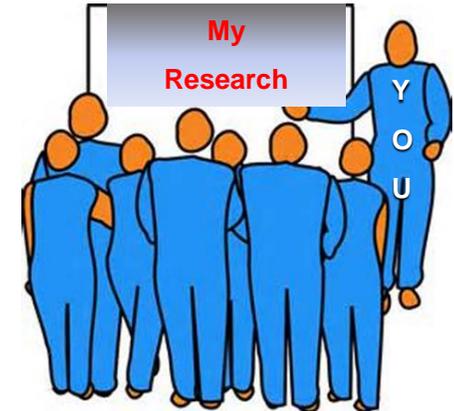
Viewers reading this line demonstrate the poster's success!

- The purpose of this lecture is to provide you with the essential principles for creating an academic poster presentation.
- The style, content, and structure of your presentation may differ depending on your specific research and the constructive recommendations provided by your advisors.
- We encourage you to foster a collaborative relationship with your advisor as you develop your poster presentation.



What is a Poster Presentation?

- You create a poster with information about your research
 - Your advisor will help and guide you
- Hang poster up at a conference/exhibit hall/designated area
- Present the poster to people in attendance.





Posters are essential for scientific communication and advancing a successful scientific career.



They provide a unique medium for presenting high-quality science and should be approached distinctively from oral presentations and published papers.



Posters serve as snapshots of your work, fostering engagement and encouraging further exploration. Valuable collaborations often start with a poster presentation.

Poster Presentation

- Look up details to determine when and where to present poster
- Five minutes early is “on time”
 - May take several minutes to find board and hang poster
- Dress business or business casual
 - Wear name tag
- Lots of people crammed into tiny space = hot
 - Bring water



Content Planning

Questions Poster Should Answer

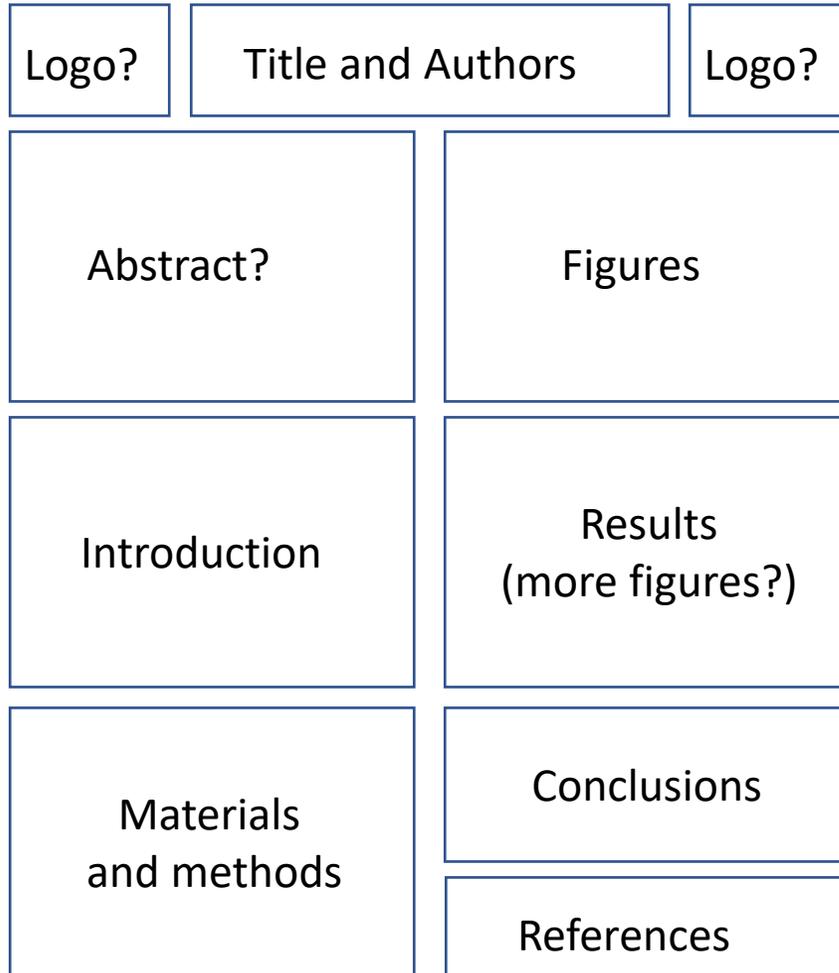
1. What is my poster presentation about?
2. Why am I conducting this research? Why does it matter?
3. What materials and methods did I use?
4. What are my results?
5. What conclusions did I make?
6. What are my recommendations or future directions based on this research?

Poster Sections

Logo?	Title and Authors	Logo?
Abstract?	Materials and methods	Results (more figures?)
Introduction	Figures	Conclusions
		References

This is a “Landscape” Layout

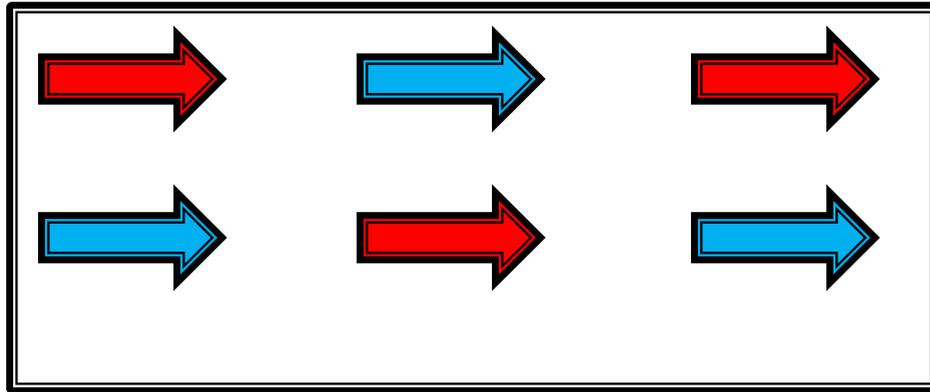
Poster Sections



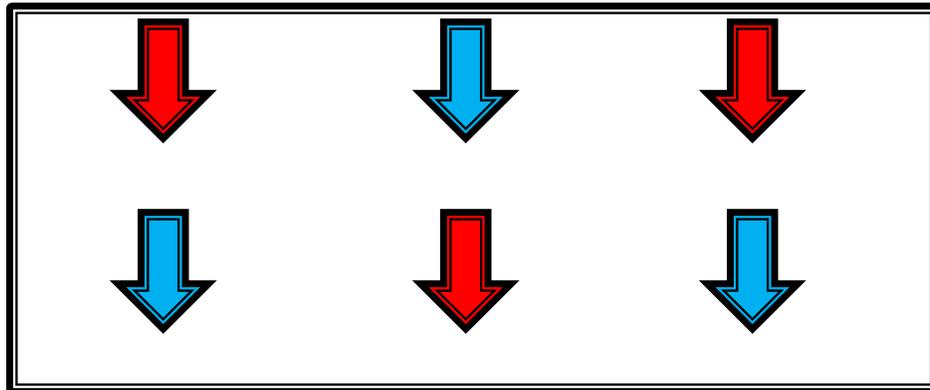
This is a “portrait” layout

Poster Sections

- Posters typically flow left to right



- Or up to down



Poster Sections

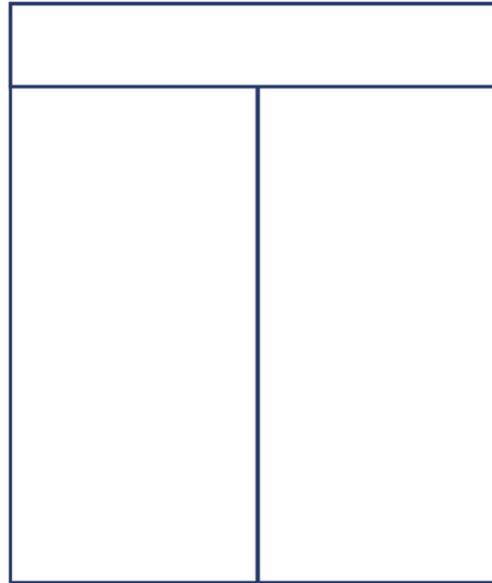
- Format and layout varies by discipline and conference
 - Posters may be square-shaped, landscape, portrait
- You may need different sections?
 - Literature review
 - Current status of research
 - Future plans
 - Funding, etc.
- Check with your advisor to determine what is normal for your discipline and adhere to conference requirements
- Check MSE 411 guidelines

Poster Sections

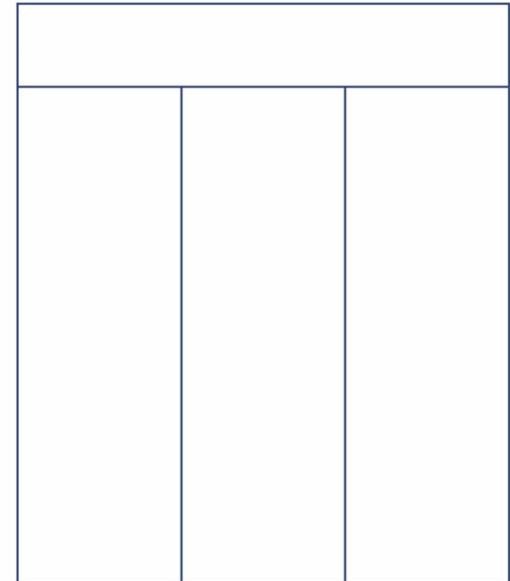
Please see the template for MSE 411 academic poster presentation

You have two options

- Two columns
- Three columns



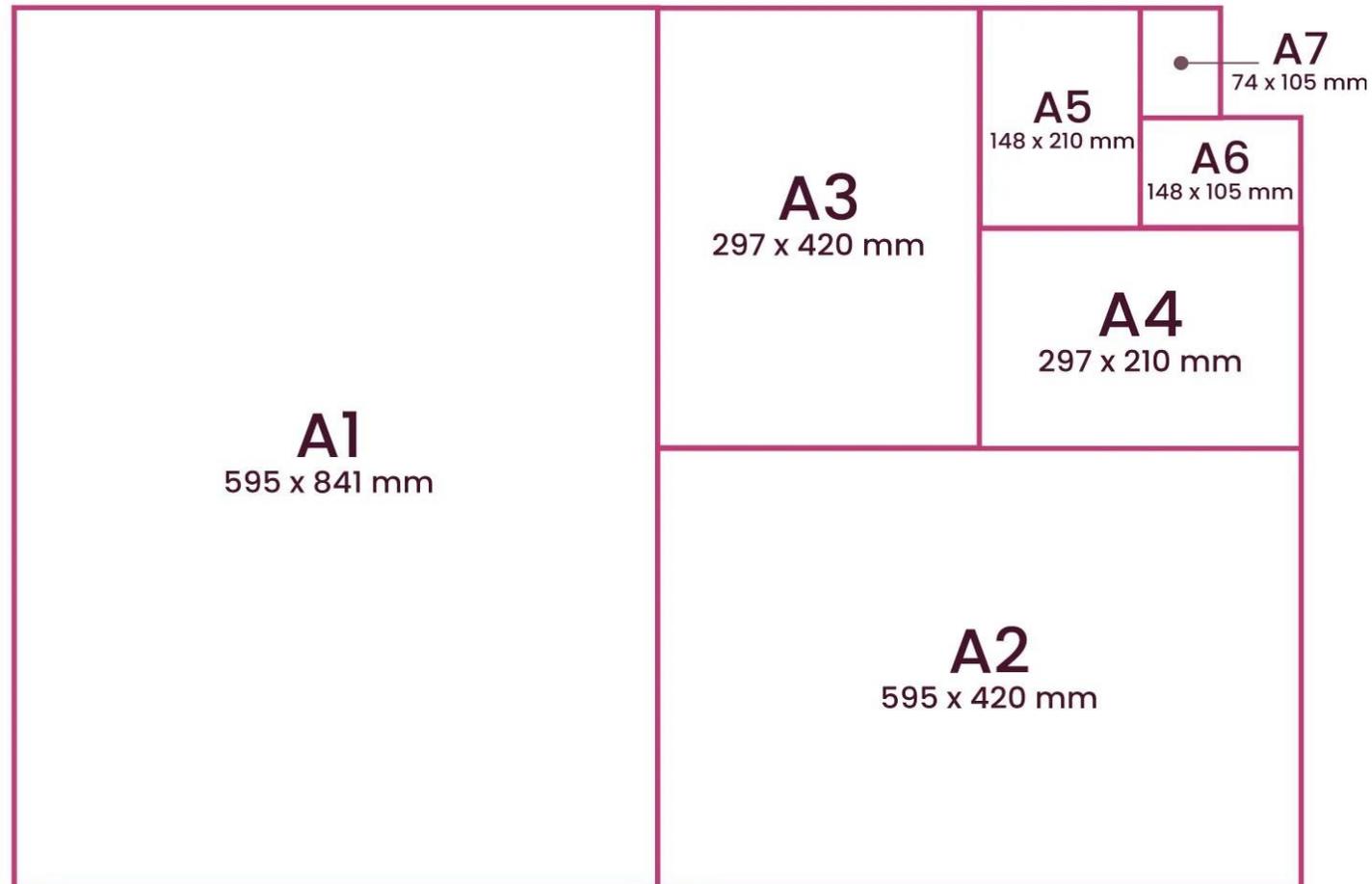
CREATED BY PLANERUM COPYRIGHT © ALL RIGHTS RESERVED. [HTTPS://WWW.PLANERIUM.COM](https://www.planerium.com)



CREATED BY PLANERUM COPYRIGHT © ALL RIGHTS RESERVED. [HTTPS://WWW.PLANERIUM.COM](https://www.planerium.com)

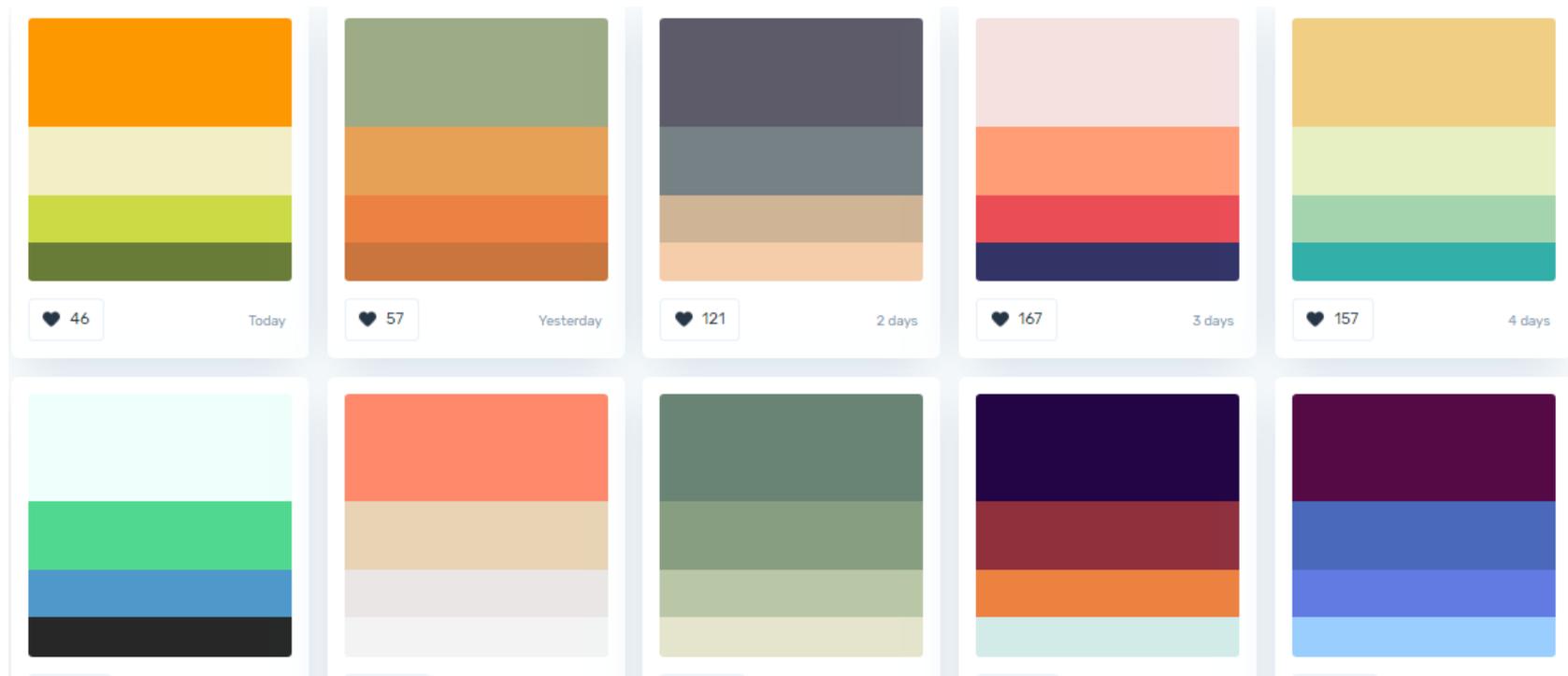
Poster Size

We will be using **A1 size** for the MSE 411 literature poster presentations.



Design principles

- Use good combinations (3 colors) and use color which is fitted to graphics.



- Make sure you have plenty of graphics to describe the findings in the literature. Text can also be written with bullet points when necessary.

Design principles

- Software
- Powerpoint
- Adobe XD
- CorelDraw
- Illustrator



Graphs and Charts

- Always include a descriptive title
- Make sure each axis has a legible label
- Avoid including gridlines
- Use color and formatting to distinguish data

Graphs and Charts

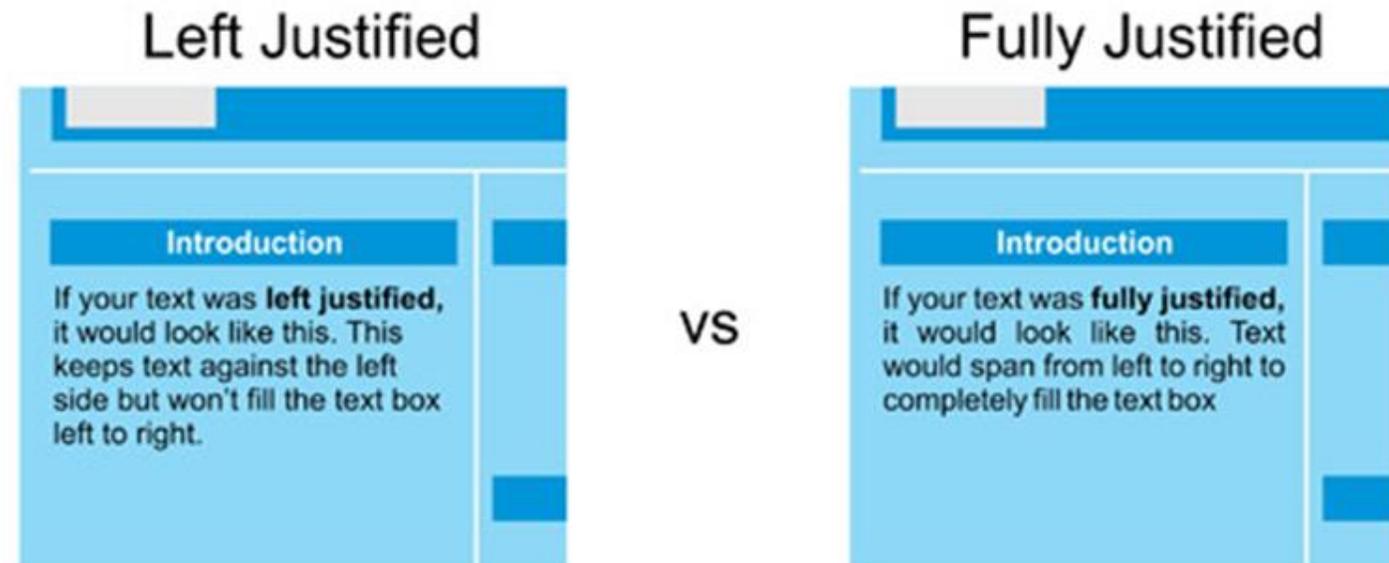
Pay Attention!

- To use images with high resolution
- To number and label all tables and figures
- To link the figures to the text
- To use as many as images possible BUT do not overload the poster with unnecessary figure.



Text

- Left aligned text is easiest to read.
- Use bullet points whenever you can, not text.
- Use readable fonts.



Size, A1 Poster

- Title: 60+
- Subtitle: 40+
- Text: 25+
- Subtext: 15+

Visual Hierarchy

Show the important points

- To highlight the important words and phrases: Underline and make bold
- Avoid using too many formats

And you will read this last

**You will read
this first**

And then you will read this

Then this one

O⁶-Benzylguanine Inhibits Tamoxifen Resistant Breast Cancer Cell Growth and Resensitizes Breast Cancer Cells to Anti-Estrogen Therapy

Joshua Smith¹, George C Bobustuc¹, Rafael Madero-Visbal¹, Jimmie Colon¹, Beth Isley¹, Jonathan Ticku¹, Kalkunte S. Srivenugopal and Santhi Konduri¹

¹Cancer Research Institute of M.D Anderson Cancer Center Orlando ²Texas Tech University Health Sciences Center, Amarillo, TX



Abstract

Endocrine therapies using anti-estrogens are least toxic and very effective for breast cancers, however, tumor resistance to tamoxifen remains a stumbling block for successful therapy. Based on our recent study on the involvement of the DNA repair protein MGMT in pancreatic cancer (Clin Cancer Res. 15, 6087, 2009), here, we investigated whether MGMT overexpression mediates tamoxifen resistance. Specifically, we determined whether administration of MGMT inhibitor O⁶-benzylguanine (BG) at a non-toxic dose alone or in combination with the anti-estrogens (tamoxifen/fulvestrant) curtails human tamoxifen resistant breast cancer cell growth. Further, we also determined whether BG sensitizes breast cancers to tamoxifen using tamoxifen resistant cells.

MGMT expression was found to be increased in breast cancer cells relative to normal breast epithelial cells. Also, MGMT levels were significantly higher in tamoxifen resistant MCF-7 compared to the parent cells. Silencing of the ER- α expression using a specific siRNA resulted in augmentation of MGMT mRNA and protein levels by 2 fold. We also observed an inverse correlation between MGMT and p53 levels in breast cancer cell lines; moreover, p53 downregulation was accompanied by increased MGMT expression. These combinations also enhanced the cytochrome C release and the PARP cleavage, indicative of decreased ER- α expression, whereas tamoxifen alone and fulvestrant alone increased and decreased the same respectively. However, all these treatments increased the p21^{ras} mRNA and protein expression significantly. BG inhibited tamoxifen resistant breast cancer growth in a dose-dependent manner and it also resensitized resistant breast cancer cells to anti-estrogen therapy (TAM/ICI). These combinations also enhanced the cytochrome C release and the PARP cleavage, indicative of apoptosis. In breast cancer xenografts, BG alone or a combination of BG with tamoxifen or fulvestrant caused significant tumor growth delay and immunohistochemistry revealed that BG inhibited the expression of MGMT, ER- α , ki-67 and increased p21^{ras} staining. These findings suggest that MGMT inhibition may provide a novel and effective approach for overcoming tamoxifen resistance.

Introduction

Recent advances in breast cancer research have identified key pathways involved in the repair of DNA damage induced by chemotherapeutic agents. The ability of cancer cells to recognize DNA damage and initiate DNA repair is an important mechanism for therapeutic resistance and has a negative impact on therapeutic efficacy. A number of DNA-damaging alkylating agents attack the nucleophilic O⁶ position on guanine, forming mutagenic and highly cytotoxic interstrand DNA crosslinks. The DNA repair enzyme O⁶-alkylguanine DNA alkyltransferase (AGT), encoded by the gene MGMT, repairs alkylation at this site and is responsible for protecting both tumor and normal cells from alkylating agents. MGMT is expressed constitutively in normal cells and tissues. In breast tumors, MGMT gene expression is elevated and levels are up to 4-fold higher than in the normal breast. Interestingly, it has been shown that tamoxifen accelerates proteosomal degradation of MGMT in human cancer cells. In 1991, Pegg, Moschel, and Dolan observed that O⁶-benzylguanine (BG) inhibited AGT and potentiated the cytotoxicity of both chloroethylating agents and methylating agents. In a series of important observations, they fully characterized the interaction between BG and AGT and its therapeutic impact. They showed that BG binds AGT, transferring the benzyl moiety to the active-site cysteine [29]. The reaction is very rapid and more potent than any other previously known AGT inhibitor. BG is not incorporated into DNA in living cells and reacts directly with both cytoplasmic and nuclear AGT. Because BG is a pseudosubstrate for MGMT which results in the covalent transfer of benzyl group to the active site cysteine, the MGMT protein is degraded after each reaction. This stoichiometric reaction mechanism effectively depletes the AGT content in tumors and the associated repair of alkylation damage. BG is currently undergoing clinical trials in various cancers to increase the efficacy of alkylating agents.

Interestingly, several observations suggest an inverse correlation between the levels of MGMT and p53 tumor suppressor proteins where wild-type p53 suppresses transcription of human MGMT expression. Unfortunately, p53 function is often inactivated or suppressed in human cancers; therefore, restoration of wt-p53 activity is essential for the success of some treatments. However, whether or not this is mediated by suppression of MGMT expression has yet to be determined. To date, the cross-talk between MGMT and ER- α (and the link to p53 expression) has not been explored in drug (i.e., tamoxifen) resistant breast tumors. The anti-estrogen tamoxifen is the most commonly used treatment for patients with estrogen receptor positive breast cancer. Although many patients benefit from tamoxifen in the adjuvant and metastatic settings, resistance to this endocrine therapeutic agent is an important clinical problem. The primary goal of present study was to investigate the mechanisms of anti-estrogen drug resistance and to design new therapeutic strategies for circumventing this resistance. The results show that MGMT expression is increased in TAM-resistant breast cancers and inhibition of MGMT by BG significantly improves TAM-sensitivity.

Results

Prolonged Treatment of Tamoxifen Increases MGMT Expression: We developed a tamoxifen resistant MCF-7 cell line by using prolonged treatment of tamoxifen on the parental ER-positive breast cancer cell line, MCF-7. Tamoxifen-resistant MCF-7 cells proliferate at rates similar to the parental MCF-7. Prolonged treatment of tamoxifen onto MCF-7 cells increased MGMT expression compared to parental MCF-7 cells by 2 fold (Fig.1).

Knocking Down ER α Enhances MGMT Expression in Tamoxifen Resistant Breast Cancer Cells: It is not known whether ER α and MGMT transcriptionally regulate each other in tamoxifen resistant breast cancer cells. We therefore investigated whether down regulation of ER α has any effect on endogenous MGMT expression in these cells. As expected, downregulation of ER α using specific siRNA significantly reduced ER α protein levels in these cells. Western blot analysis was performed and the results in the left panel (Fig. 2A) shows that silencing of ER α increases MGMT expression in these cells, and interestingly, the results in the right panel (Fig.2B) show increased MGMT mRNA levels were increased as assessed by qRT-PCR. These data suggest that ER α -mediated signaling functions to repress MGMT gene expression in breast cancer cells.

Transcriptional Regulation Between MGMT and p53: Previously, it was reported that p53 negatively regulates MGMT in breast cancer cells. Therefore, we addressed whether or not silencing the p53 enhances endogenous MGMT transcription. Tamoxifen resistant MCF-7 cells were transfected with either p53 siRNA (p53-KD) (Fig.2C) or MGMT siRNA (MGMT-KD) (Fig.2D) along with Non-specific siRNA (NS). MGMT expression was consistently increased in p53 knock down cells, with different experiments showing a ~2 fold augmentation (Fig. 2A) and as expected, knocking down MGMT decreased MGMT transcription where as p53 mRNA levels were unaffected in MGMT knockdown cells (Fig.2D). These results confirm that p53 can regulate MGMT at the transcriptional level.

Figure 1. MCF-7 parental and tamoxifen resistant MCF-7 cell pellets were prepared, proteins were isolated and MGMT expression was detected by western blot analysis. Tamoxifen resistant MCF-7 breast cancer cells significantly increased MGMT expression compared to MCF-7 parental cells.

O⁶-Benzylguanine Plays a Dual Role in Tamoxifen Resistant MCF-7 Cells: Contrasting with the experiments above, next, we studied whether or not knocking down MGMT, as expected, knocking down MGMT decreased MGMT gene transcripts. However, it was interesting to find that ER α gene transcription was also reduced after MGMT silencing (Fig.2E). These data demonstrate that BG has the ability to attenuate the not only the MGMT, but also the ER α transcription, indicating a possible dual role for MGMT blockers in these breast cancer cells.

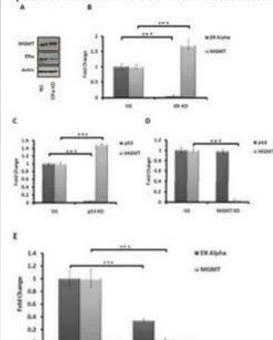


Figure 2. (A) Tamoxifen resistant MCF-7 cells were transfected with ER α siRNA (100nM) (ER α -KD) and NS siRNA (100nM) (NS), and cells were harvested 72h post transfection. Total proteins were isolated and ER α and MGMT expression were determined by western blot analysis. MGMT protein levels were significantly reduced in ER α knock down cells (B) Tamoxifen resistant MCF-7 cells were transfected with ER α siRNA (100nM) (ER α -KD) and NS siRNA (100nM) (NS), and cells were harvested 72h post transfection. Total RNA was isolated and MGMT and ER α transcription was determined by qRT-PCR. MGMT transcription was significantly increased in ER α knock down cells. (C) Total RNA was isolated from non-specific siRNA (NS) (100nM) and p53 siRNA (p53-KD) knock down tamoxifen resistant MCF-7 breast cancer cells. MGMT and p53 transcription was determined by qRT-PCR. Total RNA was isolated from non-specific siRNA (NS) (100nM) and MGMT siRNA (MGMT-KD) knock down tamoxifen resistant MCF-7 breast cancer cells. MGMT and p53 transcription was determined by qRT-PCR. There is an inverse correlation between MGMT and p53 in tamoxifen resistant breast cancer cells (C & D).

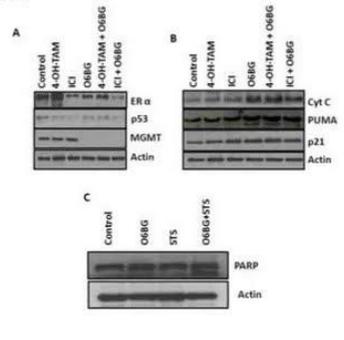


Figure 3. (A) Tamoxifen resistant MCF-7 breast cancer cells were treated in presence or absence of BG (50 μ M) and 48h post treatment 4-OH-TAM (40nM), ICI (1 μ M) either alone or in combination with BG. 24h post treatment cells were harvested and protein levels were isolated and western blot analysis was performed. (A) ER α , p53 and MGMT expressions (B) Cytochrome C, PUMA and p21 were determined by western blot analysis (C) Tamoxifen resistant MCF-7 cells were treated with or without BG for 48h and later treated with staurosporin (5 μ M) for 1h. PARP cleavage was determined by western blot analysis.

O⁶-Benzylguanine Modulates p53 Down-Stream Targeted Protein Expressions: Encouraged by the results reported, we investigated the effect of combination therapy on endogenous MGMT, p53, and ER α protein expressions. As expected, BG decreased MGMT expression, while combination therapy (4-OH-TAM or ICI combined with BG) significantly decreased both MGMT and ER α expressions. BG alone or in combination with tamoxifen or ICI decreased ER- α expression, whereas tamoxifen alone and ICI alone increased and decreased the same respectively (Fig.3A). p53 expression was slightly altered after ICI treatment. The reduction in p53 expression by ICI alone was reversed when BG was combined (Fig.3A). We investigated the effect of BG on proteins which are involved in cell cycle regulation, apoptosis in tamoxifen resistant breast cancer cells. All these treatments significantly increased the p21^{ras} protein expression (Fig.3B). PUMA expression was also increased with these treatments. Hence, PUMA may have translocated to the mitochondria, cytochrome C is released (Fig.3B), and apoptosis was triggered in these cells in presence of combination therapy. PARP cleavage is seen in BG treated cells in presence of staurosporin as an indicative of apoptosis (Fig.3C). Therefore, this data suggest that BG promotes cell cycle arrest and can induce apoptosis by modulating p53 function.

O⁶-Benzylguanine Modulated Transcriptional Targets in Tamoxifen Resistant Breast Cancer Cells: The effect of combination therapy on endogenous MGMT mRNA levels was also studied. Quantitative real-time PCR (qRT-PCR) revealed that anti-estrogens (TAM/ICI) increased the MGMT expression while the combination therapy decreased it compared to control levels. ER α transcription was decreased compared to controls with all these treatments (Fig.4A). Surprisingly, p21 and PUMA mRNA were slightly increased in the presence of combination treatments (Fig.4B & C). These results suggest that p53 mediated target gene transcription was affected by the drug combinations in breast cancer cells (Fig. 3 & 4).

O⁶-Benzylguanine Enhances p21 Transcriptional Activity in Tamoxifen Resistant Breast Cancer Cells: In order to investigate the effect of BG on p53 function, we performed luciferase reporter assays. Tamoxifen resistant MCF-7 breast cancer cells were transfected with p21 luciferase promoter construct in presence or absence of BG (target gene of p53). These results clearly demonstrate that BG significantly enhanced p21 transcriptional activity by ~4.5 fold in these cells (Fig.4D).

Figure 4. Tamoxifen resistant MCF-7 breast cancer cells were treated in presence or absence of BG (50 μ M) for 48h and later 4-OH-TAM and ICI (1 μ M) was either alone or in combination with BG. BG and 48h later cells were harvested and total RNA was isolated. (A) MGMT and ER α (B) p21 transcription (C) PUMA transcription was determined by qRT-PCR. 4-OH-TAM and ICI induce MGMT transcription. BG induced PUMA and p21 transcription. (D) Tamoxifen resistant MCF-7 breast cancer cells were transfected with p21 luciferase construct and 48h later treated with BG and 48h later cells were harvested. p21 transcriptional activity was significantly increased by BG in these cells.

O⁶-Benzylguanine Inhibits Tamoxifen Resistant Breast Cancer Cell Growth and Increase Resistant Breast Cancer Cell Sensitivity to Anti-Estrogen Therapy (TAM/ICI): Detailed necropsy revealed that all the mice had tumors in the breast. The data summarized in Table 1 show the daily BG alone or in combination with twice weekly tamoxifen/ICI significantly decreased median tumor volume and weight as compared with that seen in tamoxifen/ICI treated and control mice. The combination of BG with tamoxifen or ICI produced the greatest decrease in median tumor volume as compared with control mice (83.99 mm³, 9.33 mm³ (TAM+BG), respectively; p<0.0001); (83.99 mm³, 21.60 mm³ (ICI+BG), respectively; p<0.0001). Tumor weight was also significantly reduced in mice treated with combination therapy as compared with control mice (81.23 mg, 22.30 mg (TAM+BG), respectively, p<0.0005); (81.23 mg, 51.57 mg (ICI+BG), respectively, p<0.0005). (Table.1). Body weight was not changed among all treatment groups as compared with control mice. No visible liver metastases were present (enumerated with the aid of a dissecting microscope) in all treatment groups.

Histology and IHC Analysis: We next determined the *in vivo* effects of BG (alone or in combination) with tamoxifen/ICI. Tumors harvested from different treatment groups were processed for routine histological and IHC analysis. Tumors from mice treated with BG alone or in combination with tamoxifen/ICI exhibited a significant decrease in MGMT, ER α , ki-67 as compared with tumors treated with tamoxifen/ICI alone or control group. p53 expression was not much altered in these treatment groups. In sharp contrast, the expression of p21 was significantly increased in tumors from mice treated with BG either alone or in combination with tamoxifen/ICI. The images were analyzed by ImageJ (NIH) and MGMT, ER α , p53, p21 and ki-67 expressions were quantified by the Immunohisto plugin. (Fig.5).

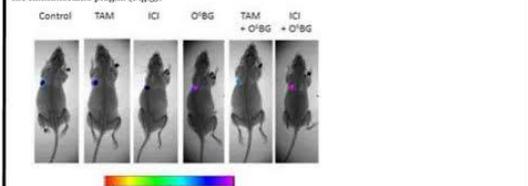
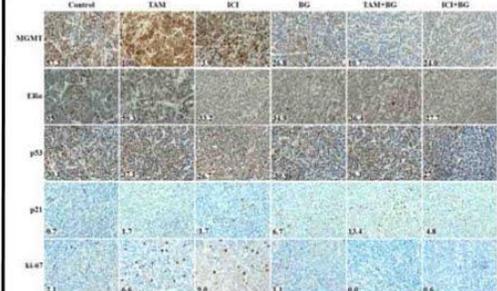
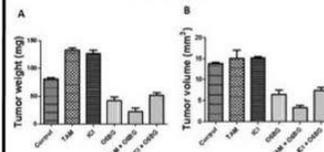


Figure 5. Tumors were harvested from control mice and mice treated with tamoxifen/ICI, BG, or both tamoxifen/ICI and BG. The sections were immunostained for expression of MGMT, ER α , p53, p21 and ki-67. Tumors from mice treated with BG either alone or in combination with tamoxifen or ICI had a significant decrease in the expression of MGMT, ER α and ki-67. p53 expression was not much altered in these treatment groups. In sharp contrast, expression of p21 was significantly increased in all these treatment groups compared to controls. Representative samples (40X) are shown.



Conclusions

- In the present study, we observed that prolonged treatment with anti-estrogens causes drug resistance by inducing the DNA repair protein O⁶-methylguanine DNA methyltransferase (MGMT).
- Decreasing the expression of MGMT by exposing breast cancer cells to BG sensitized these cells to anti-estrogen therapy (tamoxifen and ICI) (182,780).
- We also observed that combination therapy of anti-estrogens and MGMT blockers not only overcame the MGMT derived drug (tamoxifen and ICI) resistance but also increased the efficacy of anti-estrogen therapy by decreasing estrogen receptor expression and restoration of the functional activity of p53 in tamoxifen-resistant breast cancer cells.
- Combination therapy inhibited tamoxifen resistant breast tumor growth *in vivo*.

Acknowledgements

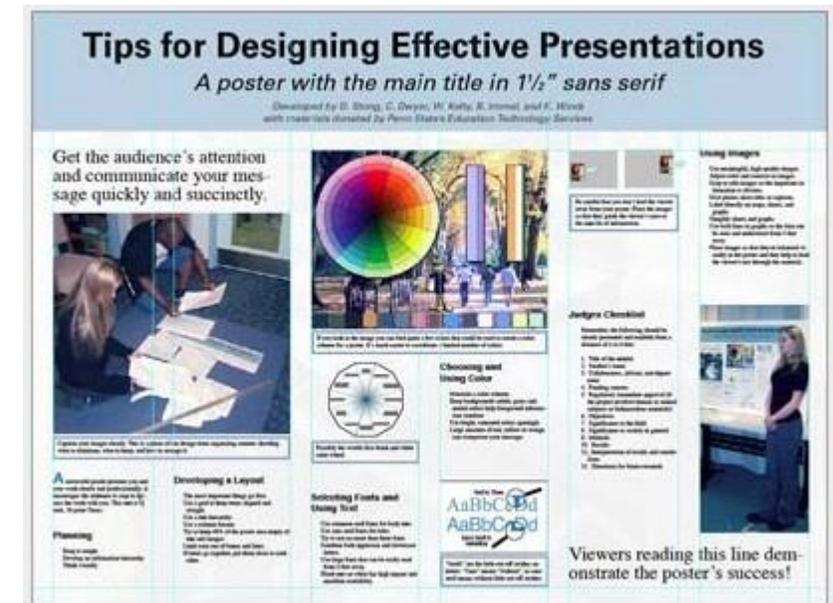
We would like to thank the Florida Department of Health, Backlund-Cole Cancer Research Program (CB) for their funding of this project.

What Makes a Good Research Poster

The poster format provides more freedom in how to present an idea than a standard academic paper, so feel free to be creative in your poster design. Don't feel limited by the text of the paper that you're basing the poster on or strict conventions of how all posters "should" look. You can use boxes, different formatting techniques, fonts, and images to create a visually pleasing poster. Generally, you want to follow these basic design guidelines:

- Important information should be readable from about 10 feet away
- Text is clear and to the point
- Use of bullets, numbering, and headlines make it easy to read
- Effective use of graphics, color and fonts
- Consistent and clean layout

<https://publish.illinois.edu/commonsknowledge/2022/04/>



Design principles

Text analysis can predict social conflict in teams.

Susie Q. Jenkins, Preston Meyers, Amanda Beckett

Michigan State University, 316 Physics Rd., East Lansing, MI 48824



Abstract

Our research group is primarily interested in understanding team dynamics in isolated and confined extreme (ICE) environments. In this research stream, we have collected data from seven U.S.-based teams deployed to the ice in Antarctica. These teams live on the ice for up to two months performing scientific research and working as a team to survive in the harsh conditions. The conditions faced by these teams serve as a proxy for those that would be experienced by a space crew on missions to Mars due to the nature of being isolated in extreme environments with important scientific, team-related tasks to accomplish.

Introduction

The conditions faced by these teams serve as a proxy for those that would be experienced by a space crew on missions to Mars due to the nature of being isolated in extreme environments with important scientific, team-related tasks to accomplish. The conditions faced by these teams serve as a proxy for those that would be experienced by a space crew on missions to Mars due to the nature of being isolated in extreme environments with important scientific, team-related tasks to accomplish.

The conditions faced by these teams serve as a proxy for those that would be experienced by a space crew on missions to Mars due to the nature of being isolated in extreme environments with important scientific.

Methods

Prior to missions, team members filled out personality and individual differences measures. During missions, we used an experience sampling methodology to collect daily reports of team functioning and processes.

Methods

These daily diaries consisted of both open- and closed-ended questions regarding team cohesion, conflict, and performance, among others. With teams consisting of 4-8 members spending up to 2 months on the ice, we have been able to collect 1472 diary entries. Two main sets of analyses have been applied to this data thus far. First, we have used Linguistic Inquiry and Word Count (LIWC) software to code open-ended diary responses for frequency of word use in over 80 language categories. We then explored how the LIWC data related to the self-report diary measures of team functioning.

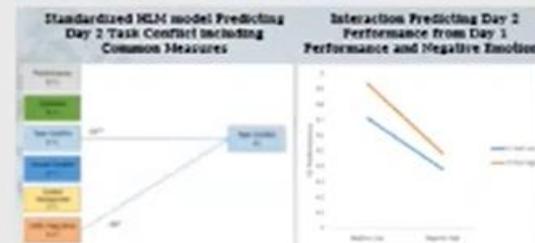
Results

Predictor	Coefficient	Std. Error	T-ratio
Word Count	.19	.033	5.69
Words per sentence	.14	.028	4.89
Function words	.12	.033	3.82
Pronouns	.10	.027	3.52
Personal Pronouns	.09	.026	3.42
3rd Person Pronouns	.09	.022	4.16
Auxiliary Verbs	.10	.024	4.06
Negative Emotions	.08	.023	3.43
Cognitive Processes	.13	.023	5.23
Discrepancies	.12	.022	5.32
Tentative Words	.08	.022	3.59
Differentiators	.09	.022	4.04

IBM Watson-Assessed Dominant Emotions Per ANIMET Crew Member

Predictor	Anger	Disgust	Fear	Joy	Sadness
Crew member #1	.43	.09	.13	.32	.07
Crew member #2	.10	.07	.38	.60	.00
Crew member #3	.13	.06	.09	.38	.02
Crew member #4	.08	.07	.49	.37	.02
Crew member #5	.13	.09	.46	.37	.00
Crew member #6	.31	.38	.13	.36	.01

Conclusions

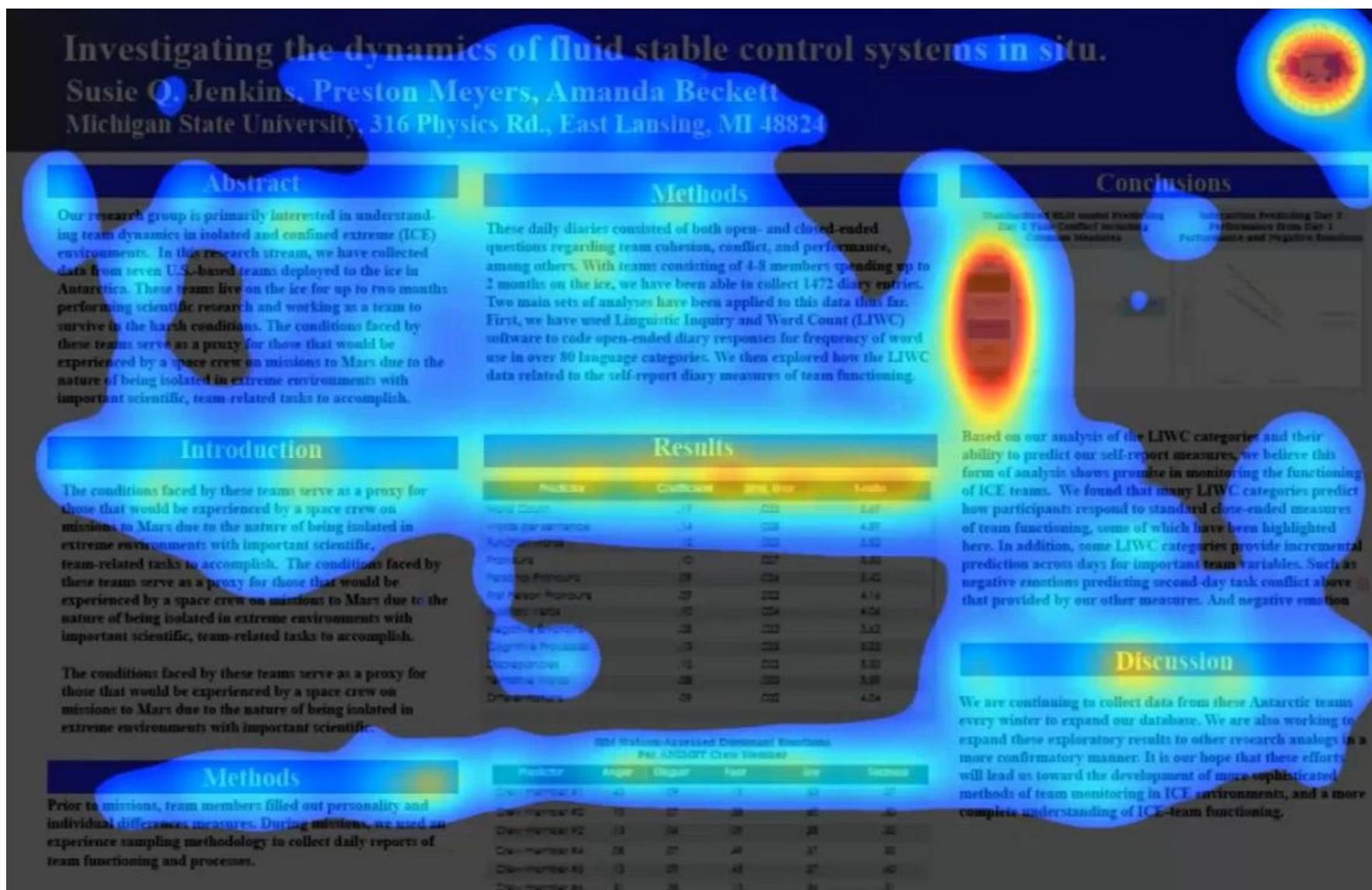


Based on our analysis of the LIWC categories and their ability to predict our self-report measures, we believe this form of analysis shows promise in monitoring the functioning of ICE teams. We found that many LIWC categories predict how participants respond to standard close-ended measures of team functioning, some of which have been highlighted here. In addition, some LIWC categories provide incremental prediction across days for important team variables. Such as negative emotions predicting second-day task conflict above that provided by our other measures. And negative emotion

Discussion

We are continuing to collect data from these Antarctic teams every winter to expand our database. We are also working to expand these exploratory results to other research analogs in a more confirmatory manner. It is our hope that these efforts will lead us toward the development of more sophisticated methods of team monitoring in ICE environments, and a more complete understanding of ICE-team functioning.

Design principles

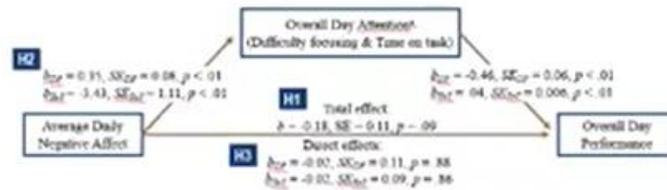


Eye tracking results
Courtesy of Mike Morrison

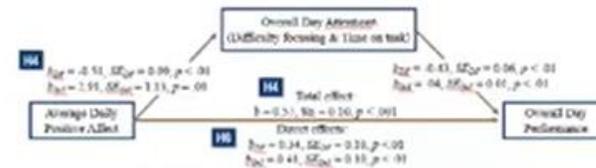
Design principles

Mood affects attention at work.

 **Negative affect is distracting,** which lowers job performance.



 **Positive affect promotes focus,** which improves job performance.



Attention is breaking down in to difficulty focusing (coded as DA) and time on task (coded as PA).

METHODS

We used an **ESM** design to survey mood in full-time workers 4 times per day over 3 weeks.



We assessed affect multiple times a day using randomly-signalied surveys for 3 weeks.

n=64
full-time adult workers
(*N* = 543 total observations)

Our ESM data collection...

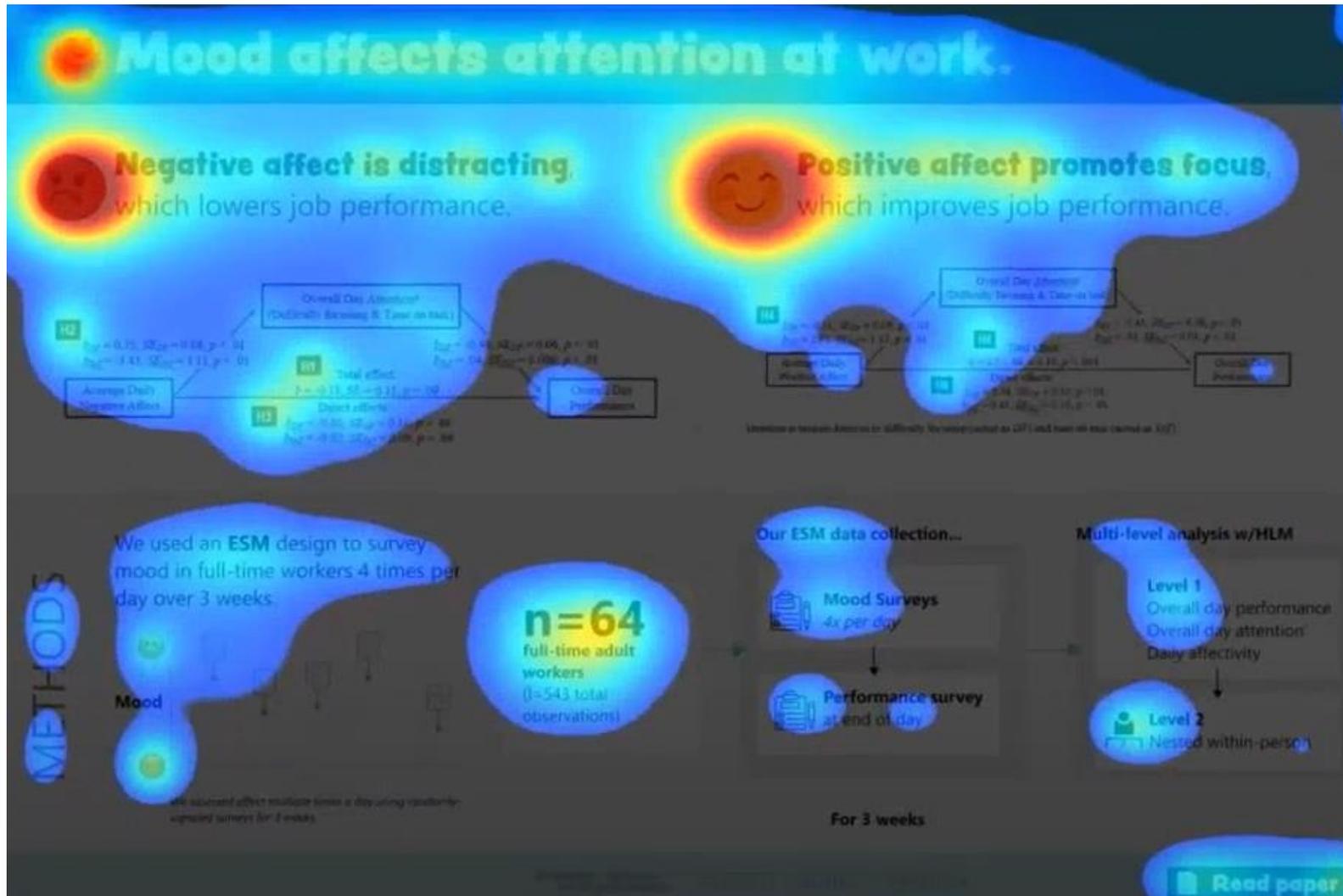


For 3 weeks

Multi-level analysis w/HLM



Design principles



Final Control

- Fast-Check: Control your argument, statistics, figure and references
- Proofread: Check spelling mistakes, repeated words and grammatical errors.
- Check references.
- Print test: Print out your A4 poster and control it.
- Save: Save the file as pdf and control it before printing the A1 size poster

References

This lecture notes inspired by personal experience and following sources;

- Creating academic poster by Tulpesh Patel
- Mastering Scientific Poster Design by Mike Morrison
- Research poster creation and presentation by John Starbuck

MSE411 – Graduation Project-1

How to prepare a presentation

Some suggestions to prepare a presentation *

Keep it simple: Concentrate on your core message

• When planning your presentation, you should always keep in mind the question:

What is the **key message** (or a few key points) for my audience to take away?

You have so much knowledge you want to share, educate and persuade.

- Instead of squeezing every ounce of your knowledge into the limited time allocated to your speech, you will be most effective by *concentrating on just one (or a few) core idea* that your audience can resonate with.
- The important thing is to keep your core message *focused and brief*. Then, your audience can walk away with a clear message after the presentation.
- **Simplicity** not only helps your audience to understand your points better, this data presentation method *lowers the risk of making a mistake, forgetting* — and saves you and your audience quite a lot of time!
 - There are different definitions of simplicity; sometimes *just a few words* are enough, while in other cases *several bullet points* on the slide may be sufficient. Choose what suits your topic best.

Gently introduce people to your accents

- With all the ethnic diversity in the world, we can all learn from our differences
- Despite speaking a common language, our *diverse backgrounds* would lead to little nuances in the way we enunciate words and the way we speak phrases.
- **Intentionally speaking slowly**, in the beginning, is not only good practice but a good technique to allow your audience to get used to your accents.
- *You need your listeners to understand your words before they can understand your ideas.*
- It's *best to practice* explaining your ideas to friends from different backgrounds to get a feel of how effective your presentation is to the public.

- **Good start to spark curiosity in your audience**

- This method of presentation is all about **attention-grabbing** because it's difficult to concentrate on listening to a new idea, even more so if the idea is boring.
- Starting your presentation with a **powerful statement, unusual fact or an interesting question** will make the audience engage in your presentation instantly.
- It is your job, as a speaker, to *spark curiosity in your audience* to make sure both you and your audience enjoy the presentation.

- **Focus on your audience's needs**

- Your presentation needs to be built around what your audience is going to get out of the presentation.
- As you prepare the presentation, you always need to bear in mind what the **audience needs and wants to know**, *not what you can tell them*.
- While you're giving the presentation, you also need to remain focused on your audience's response, and react to that.
- You need to *make it easy for your audience* to understand and respond.

- **Present data visually**

- Visuals are a must for any presentation and are able not only to support your speech but also to tell and contribute to the stuff you're telling about.
- The **pictures, graphs, infographics, and even short videos** are what truly make the presentation, and help you to connect with your audience because *NOT all people perceive numbers and data in the same way.*
- A carefully selected visual connects both with your speech and the slide content, making your presentation methods work in complete harmony.
- Visuals can serve as a great way to *help you recall your speech* in case you suddenly forgot some of it during the presentation.

- **Know your audience**

- Make sure that the data presentation methods you are using **make your data relevant to your audience.**
- You can just tell the audience what it wants and expects to hear.
- Such an approach would result in the *satisfied and interested audience* enjoying your presentation.

Practice your presentation over and over again

- **Don't rush to tell your presentation just once you've made it.** Instead, try to **first rehearse** your presentation in front of a mirror, or find a friend to listen to you speak and provide constructive feedback.
- This presentation technique allows you to spot the mistakes and downfalls in your speech.
- It can also make you *more confident*, as with each time you rehearse you'll memorize your stuff better and better.
 - it is important to not make unnecessary pauses and *avoid the "ummm", "oh" and other similar stuff* that slows down your presentation and may put off the audience
- When you are presenting, it's important not only **WHAT** you say, but also **HOW** do you say it.
 - Creating **a proper voice for presentations** is actually one of the things you need rehearsal for.

Tell stories

- Human beings are programmed to respond to stories. *Telling a story is a powerful presentation technique* for keeping the audience interested.
- In general, people get bored from being fed just straight-up facts and numbers for a long time. However, an interesting story, **connected to the subject of your presentation** gives that personal touch to it, engaging the audience into what you are talking about.
- A good story in the context of the presentation will actually resonate with the audience, causing more approval to you as an expert. Think about what story you are trying to tell your audience, and create your presentation to tell it.

Back up plan

- Even though you may plan everything in advance, **something can always go wrong.**
- The strange ability of the hardware to malfunction right in the middle of your presentation is probably one of the most known presentation-related memes.
- So, **plan at least some of the bad scenarios.**
 - have a printed set of slides with you during your presentation.
 - check everything right before you'll start presenting.
- A good idea also is to have *your script written out* so that in case you have completely forgotten some of its parts, you can easily and quickly look into it and go on with the presentation.

Relax, Breathe and Enjoy

- Actually, the most common reason for the mistakes are the **nerves and fear a lot of people feel** while presenting.
 - one option is to start by *concentrating on your breathing*. Slow it down, and make sure that you're breathing fully. Make sure that you continue to pause for breath occasionally during your presentation too.
- It's absolutely normal to be a little worried about the presentation, but you have to instill confidence in your knowledge and expertise with the subject among the audience, and it's hard to do if you feel fear.
- **Try to reason with yourself**
 - you have rehearsed, prepared great visuals, learned about the audience and even have a plan B in case the situation gets worse.
- **There's nothing to worry about**
 - *you have all the right presentation techniques!*

Other important points to consider:

1. It has been estimated that more than **three quarters of communication is non-verbal**. As well as your tone of voice, *your body language* is crucial to getting your message across.

- Body language to *avoid* includes crossed arms, hands held behind your back or in your pockets, and pacing the stage.
- Make your gestures open and confident, and move naturally around the stage, and among the audience too, if possible.

1. **If you have full sentences and too many**, you will probably start reading and you will lose the interest of your audience. *A full sentence is NOT required at all*. You can only mention keywords or make short sentences.

2. Remember the **10-20-30 Rule** for slideshows

- Contain no more than 10 slides (depends on the allocated time for you)
- Last no more than 20 minutes (in most of the conferences, your total time is about 15-20 mins)
- Use a font size of no less than 30 point (important as it stops you trying to put too much information on any one slide).
 - Legible font size to be clearly seen from the back of conference room is essential.

4. A **formal (or semi-formal) attire** is required.

5. Make sure that **color contrast** in your presentation does not blind your data.

TITLE PAGE



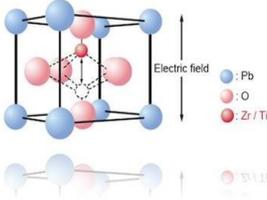
ANKARA YILDIRIM BEYAZIT UNIVERSITY
FACULTY OF ENGINEERING AND NATURAL SCIENCE

**CHARACTERIZATION OF HARD AND SOFT $PbZr_{0.52}Ti_{0.48}O_3$
CERAMICS FABRICATION BY GEL CASTING METHOD**

GRADUATION PROJECT THESIS
DEPARTMENT OF METALLURGICAL and MATERIALS
ENGINEERING

Melike DÖNMEZ

ADVISOR
PROF. DR. CİHANGİR DURAN



Effect of High Energy Milling on the Formation and Properties of Sialon Ceramics Prepared from Silicon Nitride-Aluminium Nitride Precursors

**C. Duran¹, M. Sopicka-Lizer², H. Gocmez³, T. Pawlik²,
M. Mikuskiewicz², K. MacKenzie⁴**

[1] Gebze Institute of Technology Dept. of Materials Science and Engineering, Gebze-Kocaeli, Turkey
[2] Silesian University of Technology, Dept. of Materials Science, Katowice, Poland
[3] Dumlupınar University, Dept. of Ceramics Eng., Kutahya, Turkey
[4] Victoria University of Wellington School of Chemical and Physical Sciences, Wellington, New Zealand

3rd International Congress on Ceramics, Nov. 14-18 2010, Osaka, Japan

Compositional engineering of glass/ceramic composites for structural applications

Cihangir DURAN and Oğuzhan Bilaç

Ankara Yıldırım Beyazıt University,
Metallurgical and Materials Engineering Department,
Ankara, Türkiye



ROMAT 2022
9th International Conference on Materials Science
and Technologies – RoMat 2022
Bucharest, Romania
November 24-25th, 2022



MICROSTRUCTURE-PROPERTY RELATIONS IN TEXTURED $Sr_{0.53}Ba_{0.47}Nb_2O_6$ CERAMICS

**Cihangir Duran,
Susan Trolrier-McKinstry, Gary L. Messing**

Department of Materials Science and Engineering
Materials Research Laboratory
The Pennsylvania State University
April 30-May 4 /2000
St. Louis, Missouri



- Make sure that title represents your overall work.
- Do not use abbreviations in your title.
- Affiliations are written separately for each researcher.
- Company or university logo can be used.

OUTLINE

- **INTRODUCTION AND BACKGROUND**
 - Low Temperature Co-Fired Ceramics (LTCC)
 - Al₂O₃ and Mullite
- **AIM**
- **EXPRIMENTAL PROCEDURE**
- **RESULTS AND DISCUSSION**
 - Al₂O₃/Glass (/hBN) and Mullite/Glass (/hBN) composites
 - Powder Characterization
 - Phase Formation and Densification
 - Mechanical Properties
 - Dielectric Properties
 - Thermal Properties
 - LTCC prototype
- **CONCLUSIONS**

Outline gives the first impression of your talk to the audience. Therefore, try to select important keywords for each subtitle.

Introduction and Background

Essential properties for a dielectric resonator

- Various dielectric constant (ϵ_r)
- Various quality factor (Q)
- Near zero temperature coefficient of the resonant frequency (τ_f)

Other important properties;

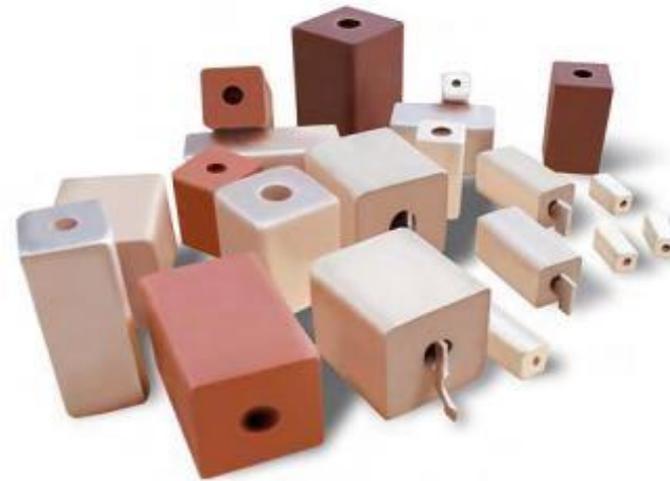
- reduction of antenna components size,
- signal selectivity,
- cost, mass, efficiency, stability, durability, robustness and ease of use
- τ_f of dielectric resonators can be designed to a desired value to meet the circuit designer's requirements.

<http://www.tect-electronics.com/uploads/files/IMC/Ceramics%20Resonators.pdf>

R. Freer, F. Azough, Microstructural engineering of microwave dielectric ceramics, *Journal of the European Society* 28(2008), 1433-1441.

Typical properties of microwave dielectric ceramics

	ϵ_r	Q•f (GHz)	τ_f (ppm/°C)
Ba ₂ Ti ₉ O ₂₀	40	36,000	+2
(Zr,Sn)TiO ₄	34-37	36,000	~20
(Sc,Ca){(Li,Nb)Ti}O ₃	36-46	38,000	+30 - 70
BaTi ₄ O ₉	38	34,000	+15
(Ca,Sr)(Ba,Zr)O ₃	29-32	27,500	±50



Commercial dielectric resonators

You briefly mention about your studies by presenting literature information (such as critical system parameters, ceramic property data, company products, etc.). Introduction and background can be separated and can be more than one slides.

Aim

- ❑ To prepare dielectric ceramic compositions for three wavelength ranges for possible microwave resonator applications:

- $\epsilon_r \geq 50$: $[(1-x)\text{CaTiO}_3 - (x)\text{Ca}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3]$ (x, mole fraction= 0.32)



- $\epsilon_r = 25-50$: $\text{Ba}_2\text{Ti}_9\text{O}_{20}$

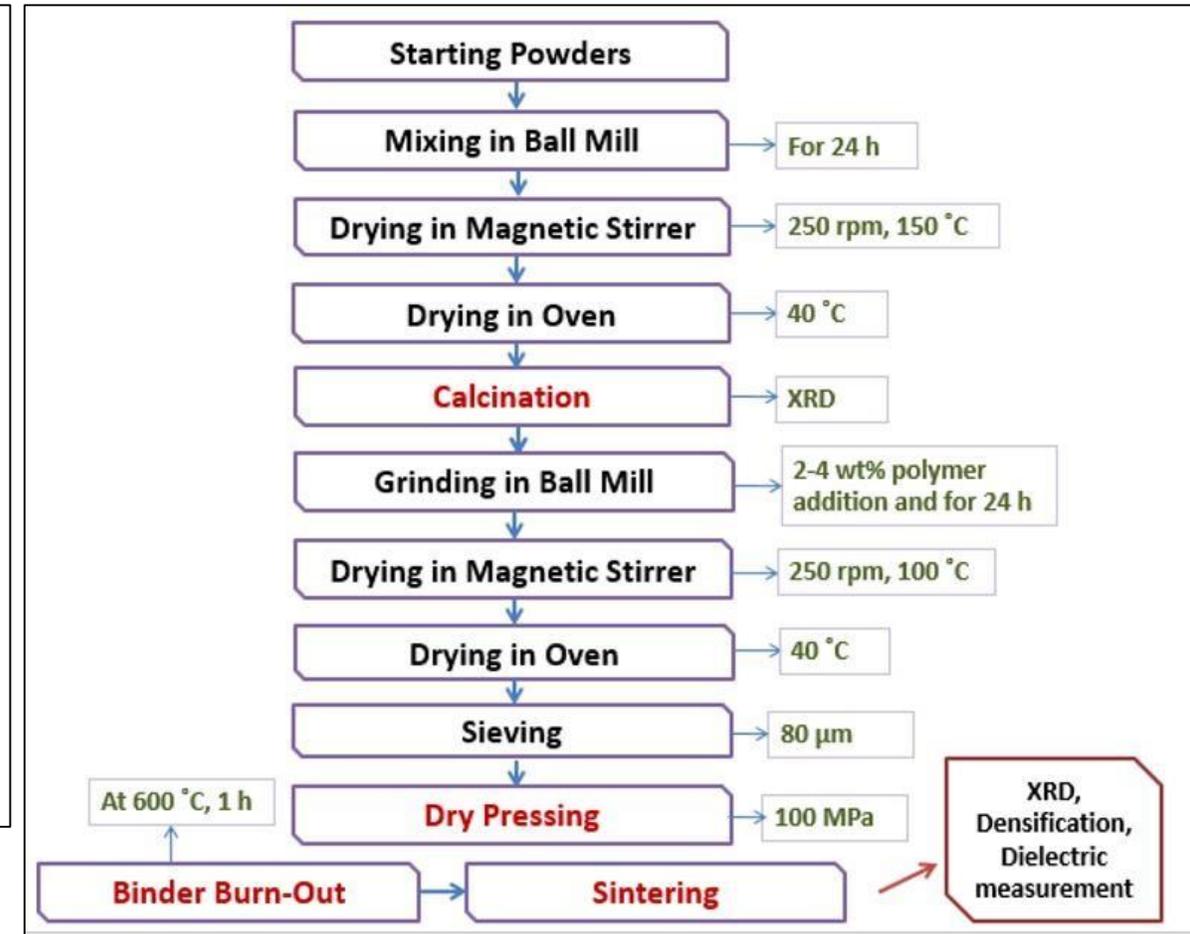
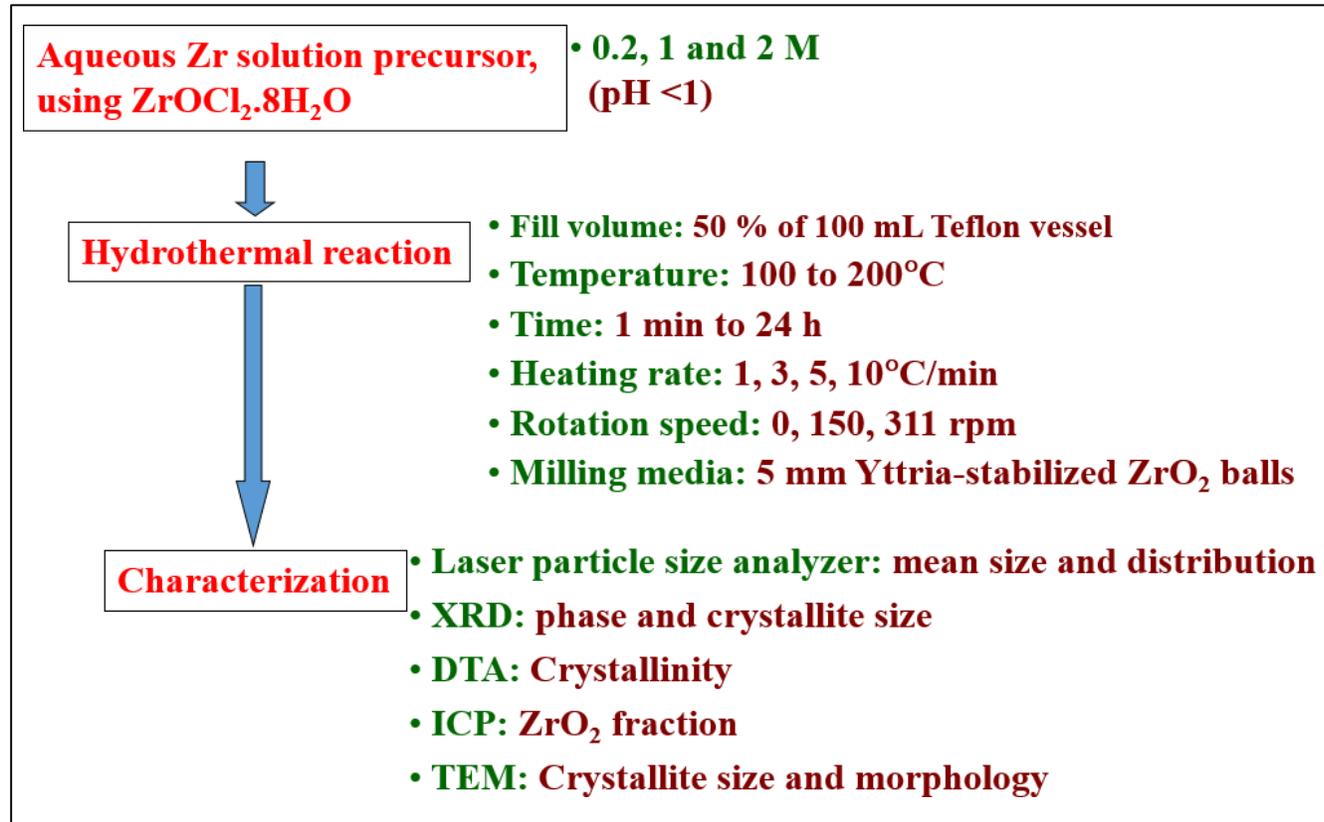
- $\epsilon_r \leq 25$: MgNb_2O_6

- ❑ To investigate densification, phase formation
- ❑ To measure dielectric properties
- ❑ To fabricate ceramics at desired dimensions

- **Optimize the properties of the base Al_2O_3 /glass composition for the LTCCs**
 - Replacing Al_2O_3 with mullite to decrease dielectric constant and increase thermal shock resistance
 - Adding hBN nano fillers to particularly improve thermal properties
- **Characterization of all composites for:**
 - Densification (bulk density, open porosity, water absorption)
 - Phase formation (second phases, reaction between phases)
 - Dielectric properties (dielectric constant and loss)
 - Mechanical properties (hardness, fracture toughness, Young's modulus and flexural strength)
 - Thermal properties (thermal conductivity and thermal expansion coefficient)
- **Prototype LTCC fabrication**
 - Tape casting and co-firing with silver electrode
 - Phase analysis (reaction between phases)

AIM of your talk is important to make the audience wonder about your study. Make sure that your results and discussion sections will be built on your aims.

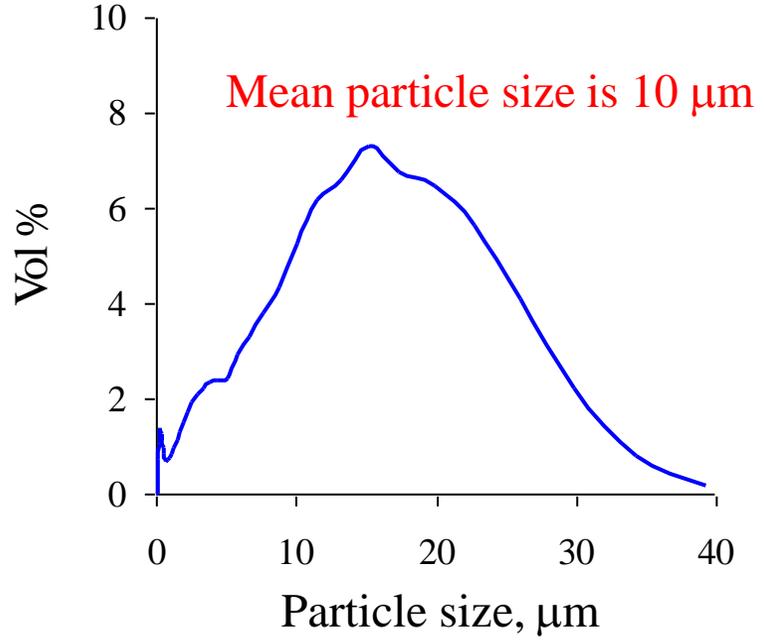
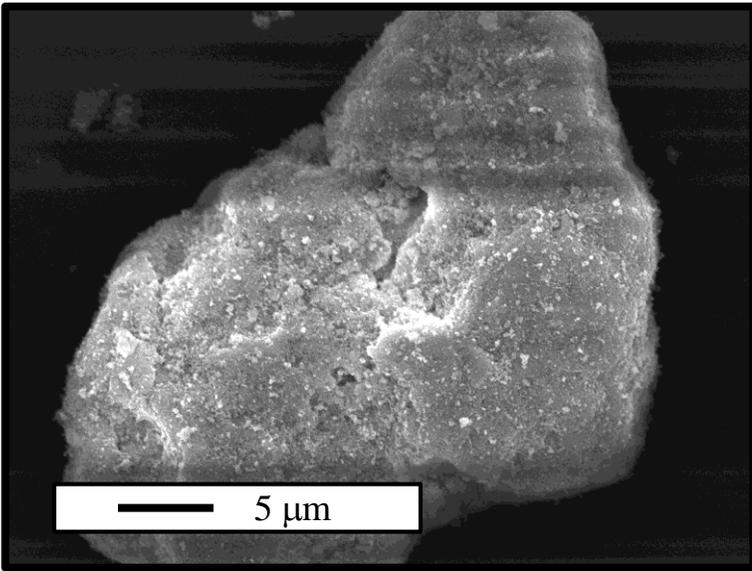
Experimental procedures



It is easy to follow experimental studies by preparing a flowchart and briefly explaining the parameters. Of course, various flowchart styles are possible.

Characterization of as-received ZrO₂ powders

As-received powder: 3 mole% Y₂O₃ stabilized ZrO₂
Average particle size 50-75 nm
S.A. 37.9 m²/g



As-received nano ZrO₂ powders are highly agglomerated

Main idea of this slide

Initial parameters to be discussed or correlated with other parameters

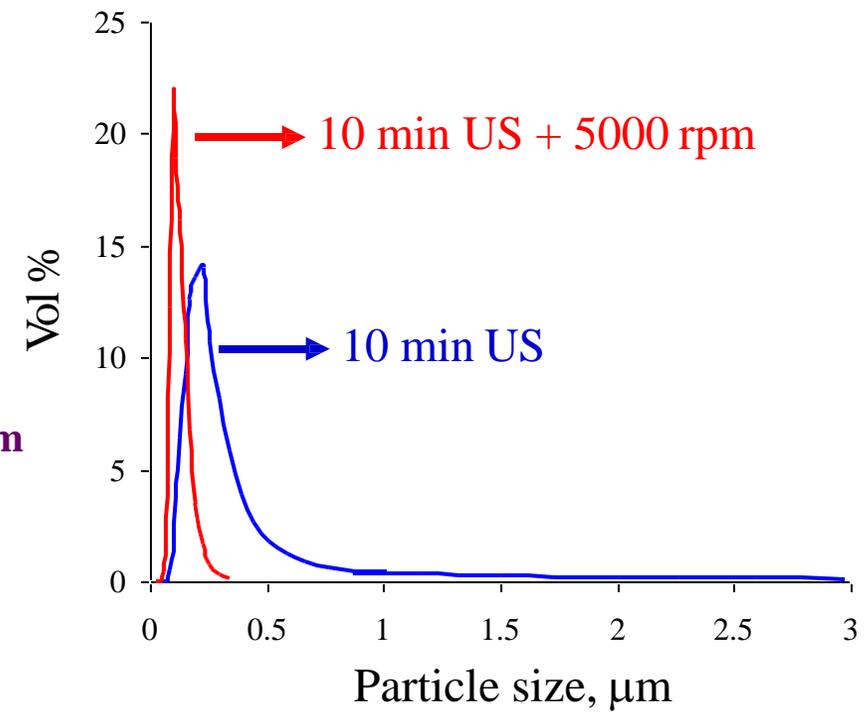
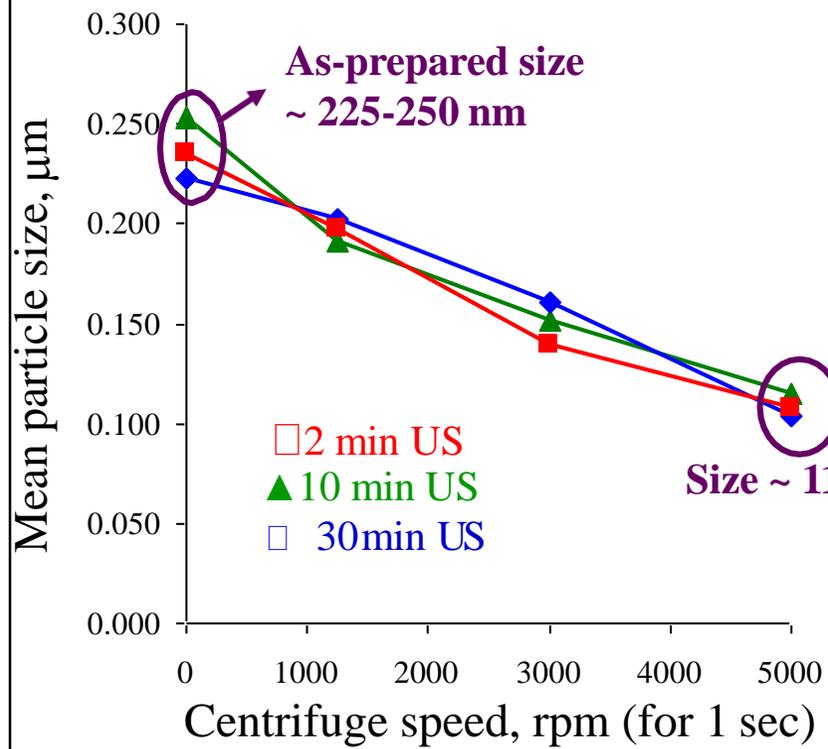
Preliminary experimental results to support main outcome. SEM and particle size distribution prove that nano particles are agglomerated.

Main outcome

Results and Discussion

Characterization of ZrO₂ suspensions without PEI

Deagglomeration ⇒ by ultrasonication (120 W) for 2, 10, and 30 mins.



Ultrasonication and centrifuging resulted in well-dispersed powders as a result of removal of hard aggregates.

Main problem or topic

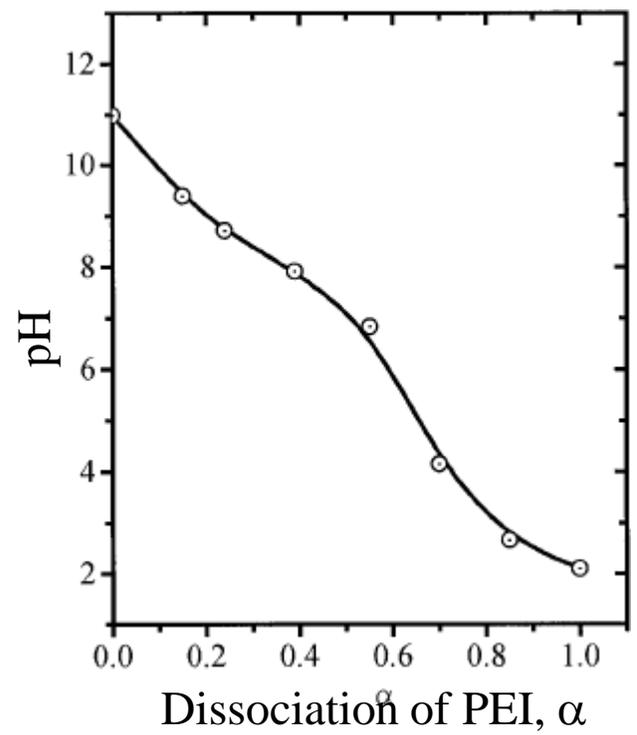
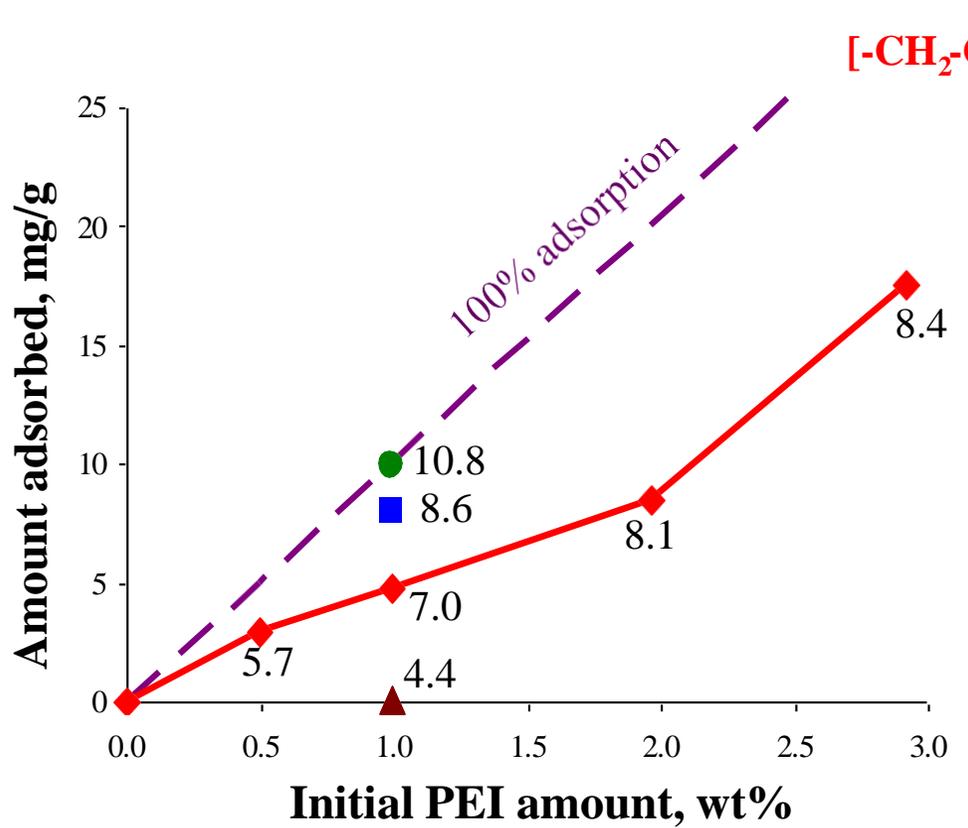
What methods are applied to solve agglomeration problem?

Combination of the graphs to summarize and compare the results

Main outcome

Results and Discussion

PEI adsorption increases with initial PEI content and suspension pH



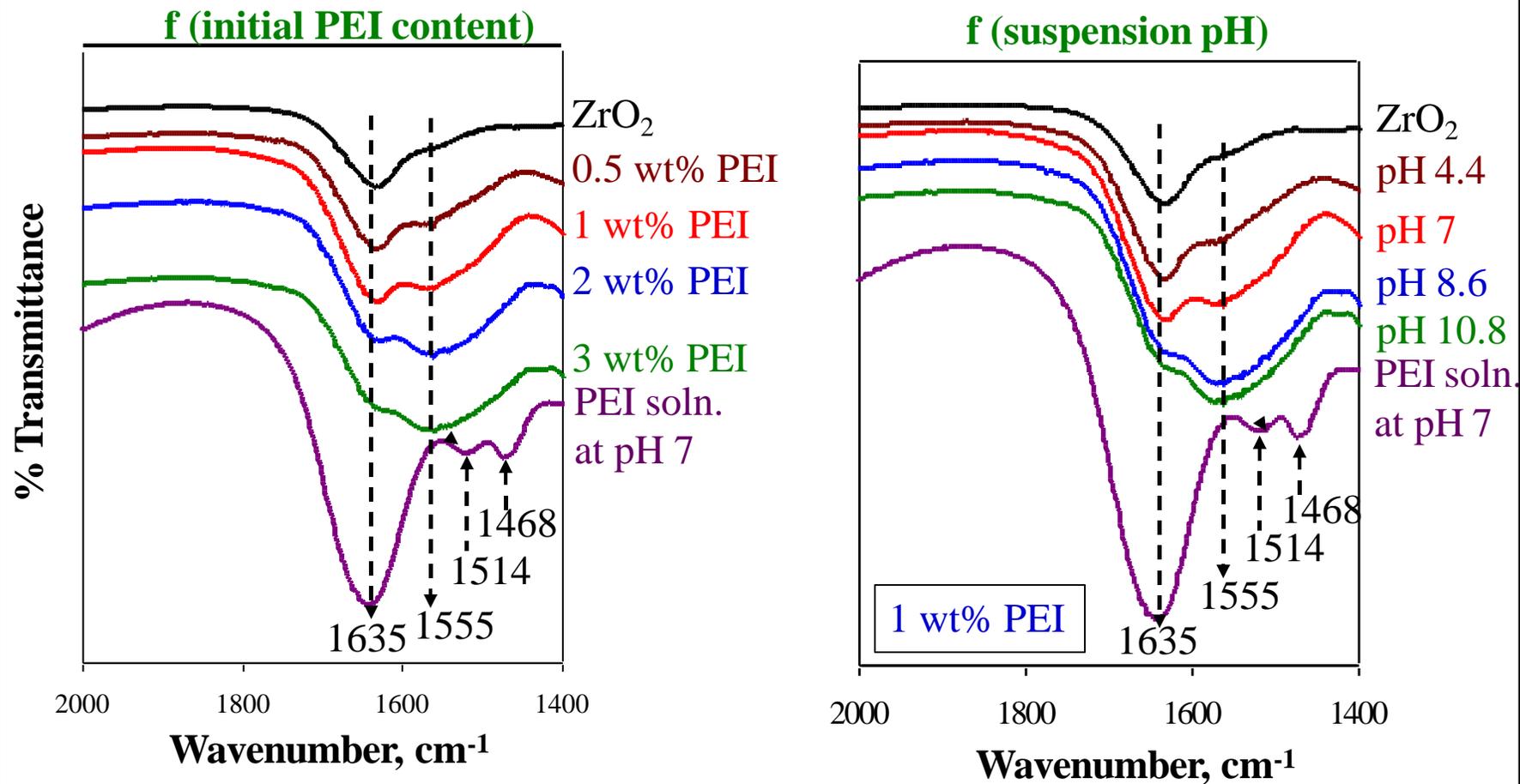
J. of Coll. and Inter. Sci. 216, 436-439 (1999)

PEI adsorption was calculated from TG plots

Enrich your results with literature data and basic equations, if necessary. Do not forget to cite the references you use.

Results and Discussion

FTIR proves PEI adsorption on nano ZrO₂ surfaces

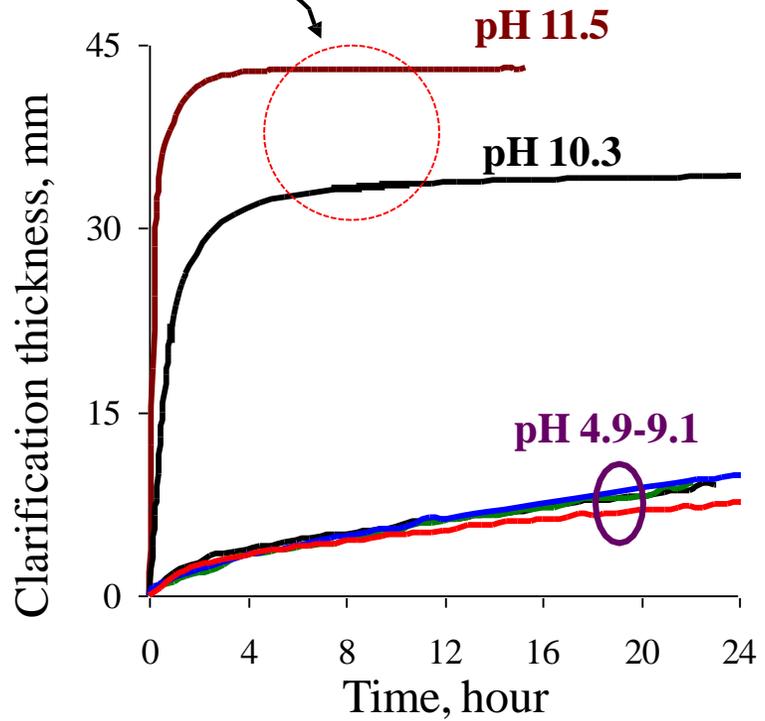
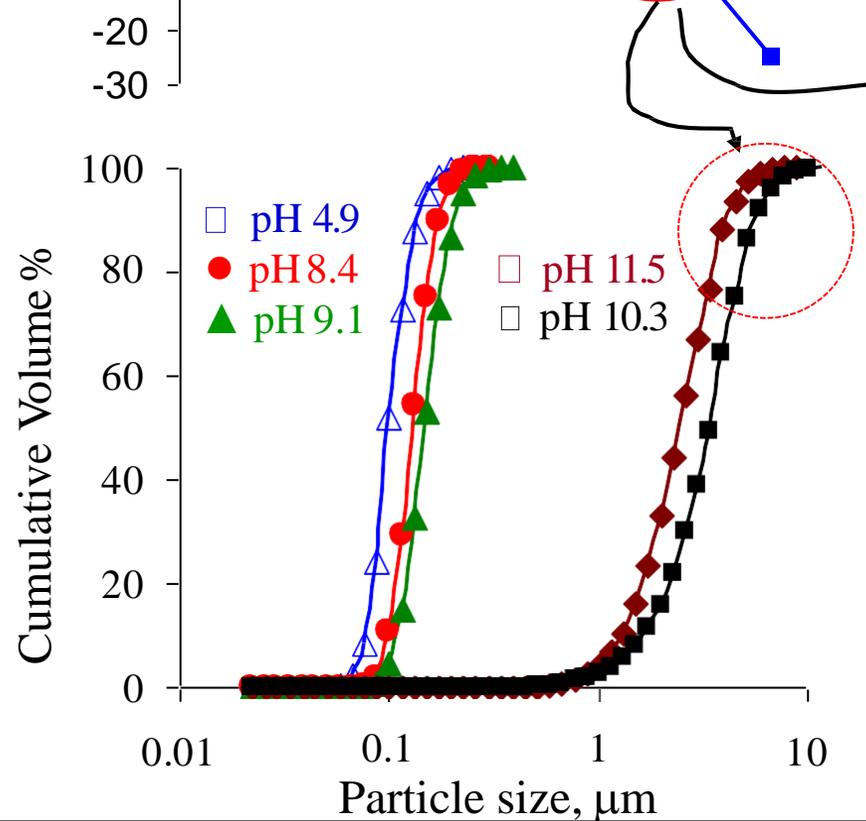
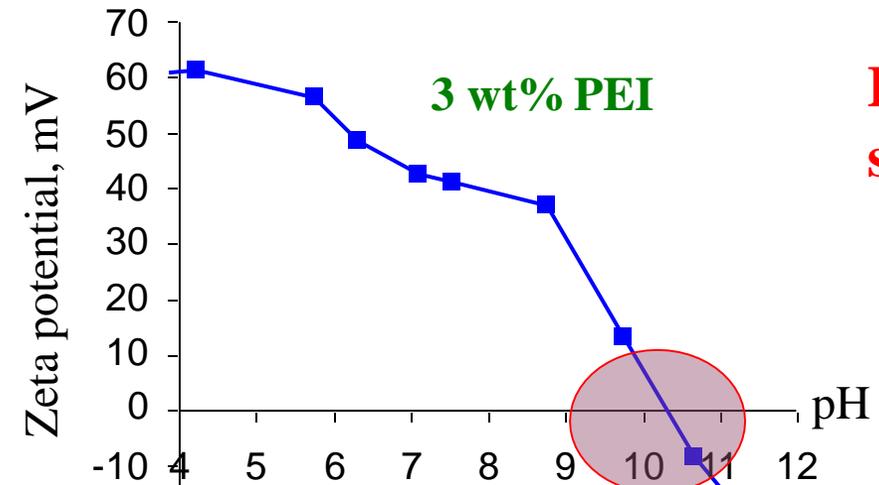


- 1635 cm⁻¹: H₂O**
- 1555 cm⁻¹: Adsorption of PEI on ZrO₂**
- 1514 cm⁻¹: -NH₂⁺- deformation vibration**
- 1468 cm⁻¹: -CH₂ deformation vibration**

It may be difficult to follow the graphs and takes time to explain all of them; therefore, list some important data points to take attention while presenting.

Results and Discussion

Bigger particle size and higher settling rate at the IEP



It is wise to express or combine various results in a single slide.

Here, zeta potential, particle size distribution and sedimentation behavior are all evaluated and correlated based on the suspension pH.

Base Al₂O₃/Glass compositions: Properties

Composition [4]	Sintering Temperature (°C)	Density (g/cm ³)	Dielectric Properties		Thermal Properties		Mechanical Properties			
			Dielectric constant	Dielectric loss	Thermal Conductivity (W/m.K) (at 75°C)	CTE (ppm/°C) (25-600°C)	Hardness (HV)	Fracture Toughness (MPa.m ^{1/2})	Young's Modulus (GPa)	Flexural Strength (MPa)
Al ₂ O ₃	1540	3.93	10.19	0.002	36 [1]	8.8 [2]	1870	4	390 [2]	411
A20	1350	3.5	8.76	0.0022	-	7.72	1040	4.5	231	379
A40	1200	2.94	7.86	0.0033	1.25	7.06	727	2.6	121	154
A50	850	2.94	7.74	0.0043	1.04	6.67	717	2.2	114	151
A55	850	2.9	7.3	0.0030	1.31	6.66	704	2.2	113	192
A60	850	2.82	7.32	0.0081	0.98	6.67	680	1.9	106	207
Glass	750	2.43	6.37	0.002	0.55 [3]	0.85 [3]	591	1	72-89 [1]	55-138 [1]

→ Suitable for the LTCCs but LOW thermal conductivity

SOLUTION: Addition of fillers with high thermal conductivity

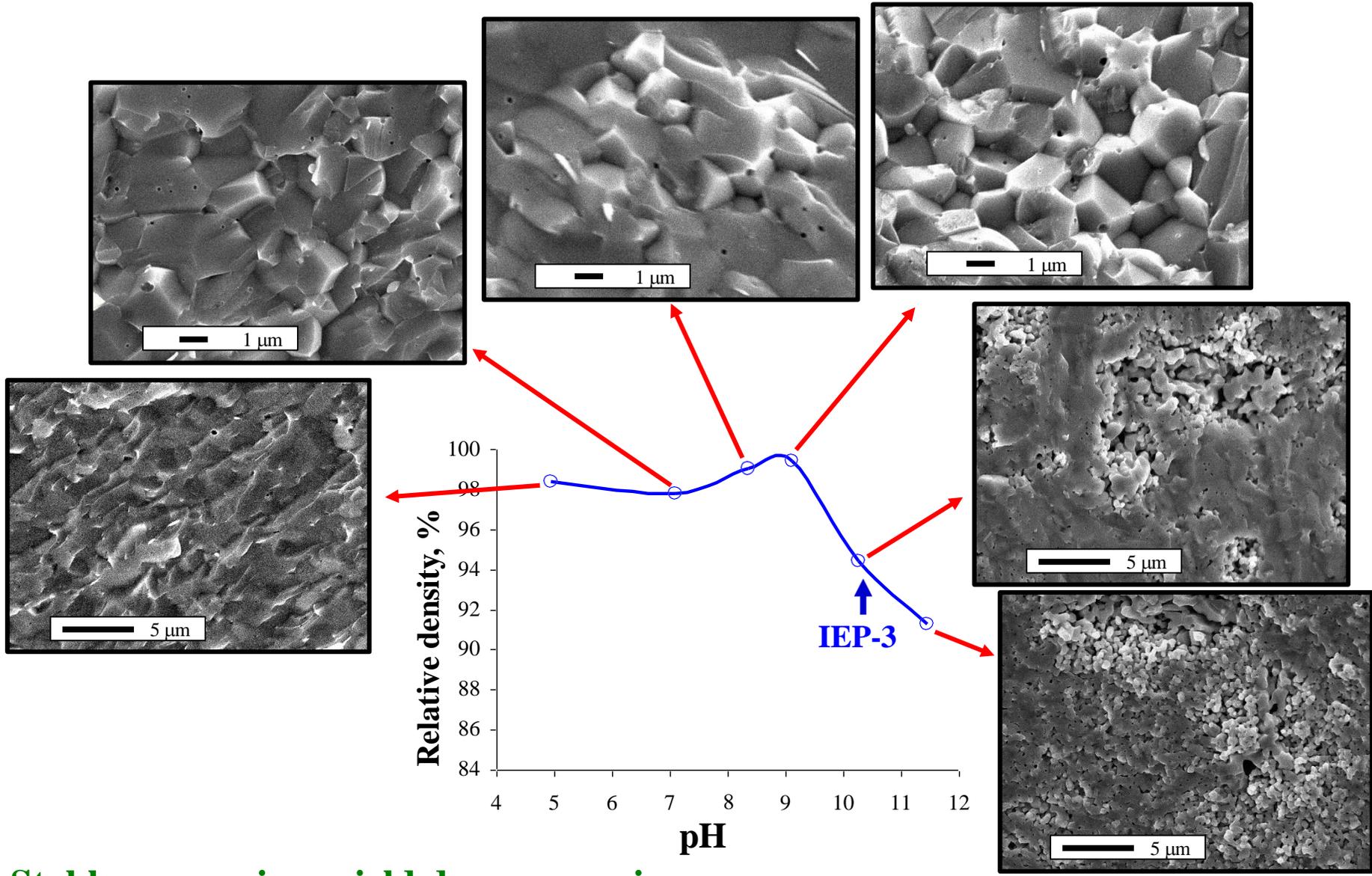
Filler	Thermal conductivity, W/m.K	
hBN	59 W/m.K parallel and 33 W/m.K perpendicular to basal plane at 25°C	Stable up to 1000°C in air
BeO	293 (25°C)	Toxicity problem
AlN	320 (25°C)	Decomposition temperature > 700°C and need non-aqueous powder processing procedures

[1] W. D. Kingery, Introduction to Ceramics, *J. Electrochem. Soc.*, vol. 124, no. 3, p. 152C, 1977.
 [2] J. F. Shackelford and R. H. Doremus, *Ceramic and glass materials: Structure, properties and processing*. 2008.
 [3] D. R. Lide, *CRC Handbook of Chemistry and Physics*, eBook, p. 3485, 2003.
 [4] Dursun GM, Duran C. Glass alumina composites for functional and structural applications. *Ceram Int*. 2019;45(9):12550-12557. doi:10.1016/j.ceramint.2019.03.194

Sometimes, a full set of data must be presented at the same time. If you need to mention some part of the data, highlight that section and take the audience's attention over there.

Results and Discussion

Microstructure evolution



Stable suspensions yield dense ceramics

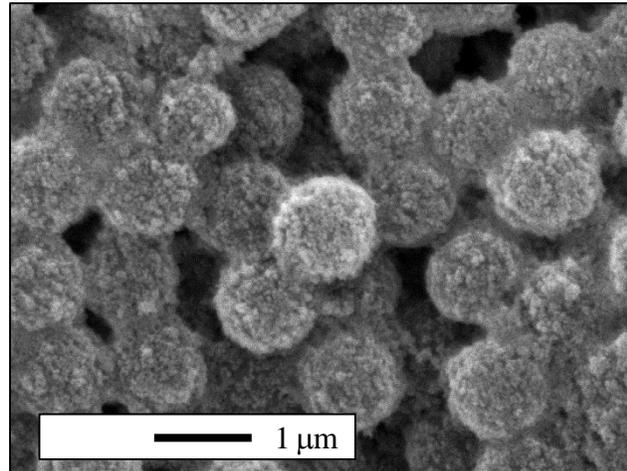
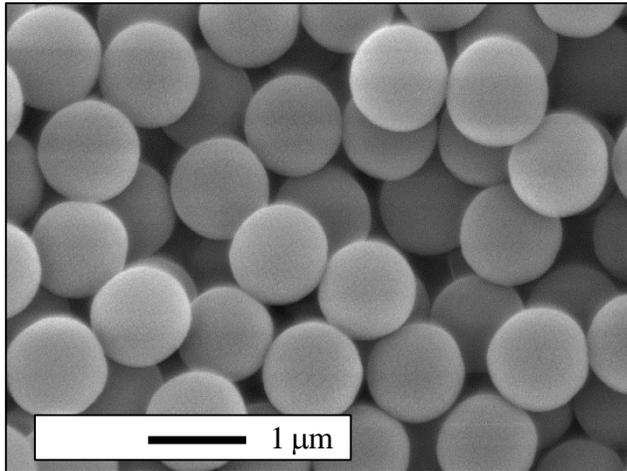
It is wise to express or combine various results in a single slide.

Here, pH dependence of the colloidal stability (or, isoelectric point-IEP) on densification is explained by combining the respective SEM pictures. In other words, green ceramics prepared from colloidally stable slurries were densified fully and microstructures were pore-free.

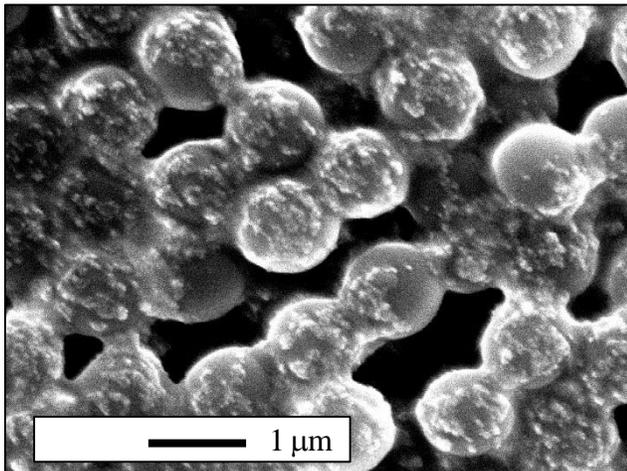
Results and Discussion

When PEI is applied, surface coverage of polystyrene particles with ZrO_2 nanoparticles consistently decreases – WHY?

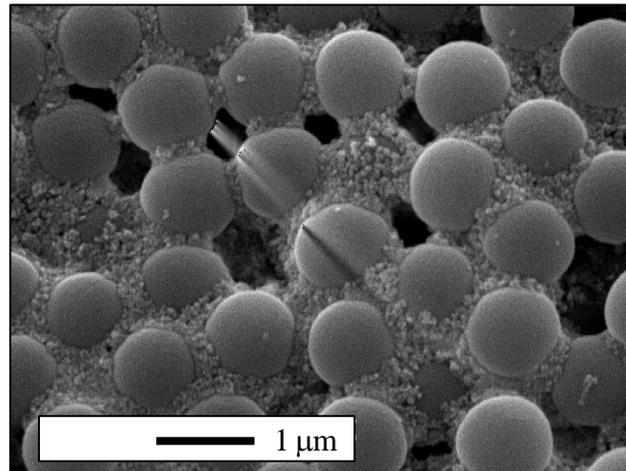
As-received polystyrene spheres Coating at 0 wt% PEI



Coating at 1 wt% PEI



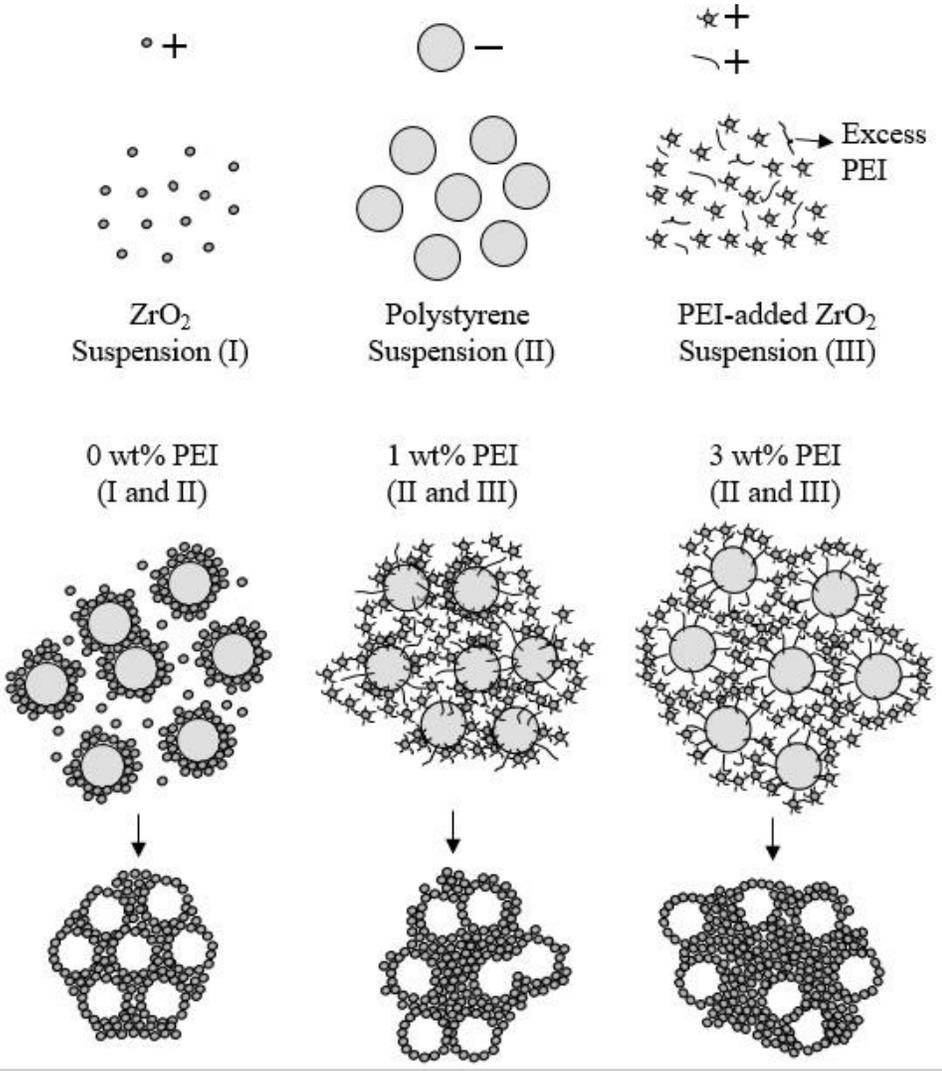
Coating at 3 wt% PEI



You can motivate the audience more by asking some questions.

Results and Discussion

Positively charged excess PEI easily adsorbs on the surface of negatively charged PS particles by electrostatic attraction, which hinders an effective coverage of PS particles with ZrO₂ nanoparticles.



wrt dry weight of polystyrene spheres
0.25 wt% excess at 1 wt% PEI
0.61 wt% excess at 3 wt% PEI

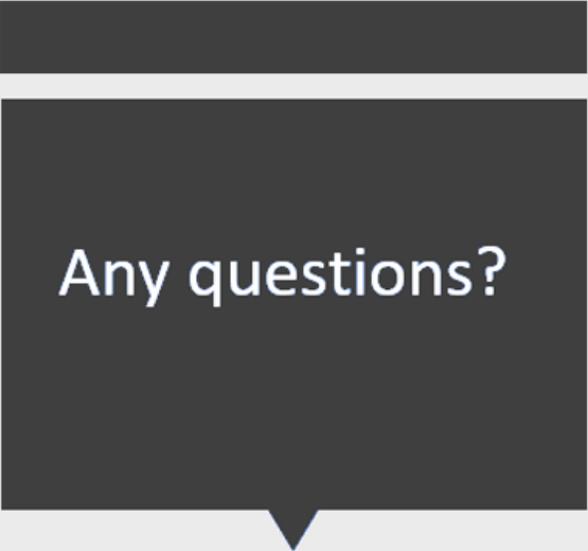
at 1 wt% PEI ⇒ partial coating
at 3 wt% PEI ⇒ almost no coating

It is sometimes easier to explain the main outcome of your results by drawing schematic pictures (or course, based on your analytical analysis)

Conclusions

- **Nano ZrO₂ powders were successfully dispersed in water, using PEI.**
- **Ultrasonication and centrifuging resulted in well-dispersed powders as a result of removal of aggregates.**
- **Isoelectric point (IEP) increased from pH 7 at 0 wt% PEI to pH 10.3 at 3 wt% PEI.**
- **Particle size increased and sedimentation rate became faster on reaching pH_{iep} due to coagulation in the suspensions.**
- **PEI adsorption increases with initial PEI content and suspension pH.**
- **Samples with densities $\geq 98\%$ were fabricated from colloidal stable suspensions.**

Main problems and their solutions are summarized in this section. This section must be correlated with the aim of the study. In fact, main outcome of each slide is listed here.



Any questions?

**Thank you for your kind
attention**

Last slide of your talk.

Establishing a research question and hypothesis

- When giving a seminar on "Establishing a Research Question and Hypothesis," it's essential to cover the fundamental principles of crafting strong research questions and hypotheses, while also providing practical examples.
- Here's a general framework and key points you can address in your seminar:

1. Understanding the Role of a Research Question:

- A research question defines the focus of your study. It's the foundation on which your research is built and should guide your entire investigation. A well-defined research question:
- **Directs your study:** It clarifies what you are trying to investigate.
- **Sets boundaries:** It helps in narrowing the scope to a specific topic, making the research more manageable.
- **Drives the methodology:** It shapes the research design, methods, and analysis.
- **Aligns with gaps in knowledge:** A good question identifies what is not yet understood or fully explored in the literature.

Key Characteristics of a Strong Research Question:

- **Clear and Focused:** It should be specific enough to be answerable.
- **Researchable:** It must be answerable using empirical evidence, data, or analysis.
- **Complex:** It shouldn't be answerable by a simple "yes" or "no"; it should require exploration.
- **Relevant:** It should address a real problem or gap in the field.

Examples of Research Questions:

- Poor: *What causes global warming?* (Too broad)
- Strong: *How does the increased concentration of greenhouse gases in the atmosphere contribute to the melting of polar ice caps between 2000 and 2020?* (Specific, measurable, and focused)

2. Steps to Formulating a Research Question:

- **Identify a Broad Topic:** Start with a general area of interest (e.g., environmental sustainability, healthcare outcomes).
- **Narrow the Focus:** Focus on a specific aspect of the topic that interests you and is feasible to research (e.g., the role of public policy in reducing carbon emissions).
- **Review the Literature:** Examine what is already known and identify the gaps. This helps refine your question to ensure it's original and relevant.
- **Define the Problem:** Identify a real-world problem or knowledge gap that your research can address.
- **Make It Specific:** Ensure that the research question is detailed enough to guide your investigation clearly.

3. Types of Research Questions:

- **Descriptive:** What is happening? (e.g., What are the patterns of internet use among adolescents?)
- **Comparative:** How does one factor compare to another? (e.g., How does hybrid learning compare to traditional learning in improving academic performance?)
- **Causal:** What causes something to happen? (e.g., What is the effect of daily exercise on mental health?)

Examples

Ineffective question

- *Can engineering products help local authorities prepare against natural disasters?* may be an ineffective question. This can be an excellent topic, but the question is too simple. Researchers can answer this question with a *yes* or *no* response. It's an obvious answer that doesn't require much research to conclude.

Effective question

- *How can engineering products help local authorities prepare against EF5 tornados?* is possibly a more effective version of the above question. It outlines a specific natural disaster, narrowing the study field and producing refined results. It can also be effective because the answer is more complex and in-depth than *yes* or *no*, providing more benefits to society.

Examples

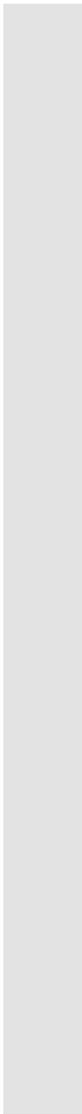
"How does the use of austenitic steel in rail manufacturing affect the durability, wear resistance, and long-term maintenance costs compared to traditional rail materials?«

"Is austenitic steel good for making rails?"

Examples

"What are the key advancements in stealth technology that enhance radar evasion capabilities, and how do these advancements impact the strategic effectiveness and cost-efficiency of modern defense systems?"

"Is stealth technology useful in the defense industry?"



4. Transitioning from a Research Question to a Hypothesis

Once the research question is established, the next step is to form a hypothesis. The hypothesis is a tentative explanation or prediction that you can test through research. It is closely tied to the research question but takes the form of a statement that can be supported or refuted.

5. Understanding Hypotheses

- A hypothesis:
- **Predicts a relationship:** It suggests an expected outcome based on prior knowledge or theory.
- **Is testable:** A good hypothesis can be measured and tested empirically through experiments, surveys, or other research methods.
- **Is specific:** It should clearly define the variables and the predicted relationship between them

Example Transition

- Research question: *How do surface treatments affect the fatigue resistance of titanium alloy scaffolds?*
- Hypothesis: *Titanium alloy scaffolds with anodized surface treatments will exhibit greater fatigue resistance compared to untreated scaffolds due to improved surface roughness and pore distribution.*

6. Types of Hypotheses

- **Null Hypothesis (H_0):** States that there is no significant effect or relationship between the variables. It is tested with the intention of being rejected or disproven.

Example: *There is no difference in the fatigue resistance of treated and untreated titanium scaffolds.*

- **Alternative Hypothesis (H_1):** States that there is a significant effect or relationship between the variables. This is what you hope to support through your research.

Example: *Titanium scaffolds with surface treatments exhibit higher fatigue resistance than untreated scaffolds.*

8. Testing the Hypothesis

- The research design and methodology will flow from the hypothesis. Testing the hypothesis involves:
- **Choosing appropriate methods:** For example, experiments, observations, or simulations that directly address the variables in the hypothesis.
- **Collecting data:** The data should either support or reject the hypothesis.
- **Analyzing results:** You will compare the findings against the expected outcome outlined in the hypothesis to draw conclusions.

9. Common Pitfalls to Avoid

- **Too broad or vague questions:** Narrow them down for focus and clarity.
- **Hypotheses that cannot be tested:** Ensure the hypothesis is measurable and can be tested with available resources.
- **Ignoring the importance of the null hypothesis:** Always consider the null hypothesis and be prepared to accept it if the data supports it.

10. Examples of Strong Research Questions and Hypotheses

- **Example 1:**
- **Research Question:** *How does temperature variation affect the growth rate of metal oxide films on titanium alloys?*
- **Hypothesis:** *Increasing the temperature will accelerate the growth rate of metal oxide films on titanium alloys due to enhanced atomic diffusion rates.*
- **Example 2:**
- **Research Question:** *What is the impact of microstructure on the corrosion resistance of steel alloys?*

Hypothesis

- *Steel alloys with a finer microstructure will exhibit higher corrosion resistance compared to those with a coarser microstructure.*
- By covering these points in your seminar, you will equip your audience with a thorough understanding of how to establish a research question and hypothesis, and how these elements drive the entire research process.

What are the key advancements in stealth technology that enhance radar evasion capabilities, and how do these advancements impact the strategic effectiveness and cost-efficiency of modern defense systems?

Research Hypothesis:

Advancements in stealth technology, particularly in radar-absorbing materials (RAM), reduced radar cross-sections (RCS), and active cancellation techniques, have significantly enhanced radar evasion capabilities. These advancements improve the strategic effectiveness of defense systems by reducing detection rates, thus increasing the survivability of military assets. Moreover, the long-term cost-efficiency of modern defense systems is positively impacted by reduced maintenance needs and the extended operational lifespans of stealth platforms, despite high initial development costs.

MSE 411-12 GRADUATION PROJECT

Project management



RESEARCH : What is it?

- "Research is a process of steps used to collect and analyze information to increase our understanding of a topic or issue". It consists of three steps: Pose a question, collect data to answer the question, and present an answer to the question".

Creswell, J. W. (2008). Educational Research: Planning, conducting, and evaluating quantitative and qualitative research (3rd ed.). Upper Saddle River: Pearson.



Steps to Develop a Research

- **Identification of Research Problem. (1)**

- What is a problem?
- What we do with problems?
- A research problem is an issue or concern that investigators present and justify in a research project to find a solution for it.

Steps to Develop a Research

- **Literature Review. (2)**
- A careful examination of a body of literature pointing toward the answer to your research question.
- **Finding too much?** If you find so many citations that there is no end in sight to the number of references you could use, its time to re-evaluate your question. It's too broad.
- **Finding too little?** On the other hand, if you can't find much of anything, ask yourself if you're looking in the right area. Your topic is too narrow.

Steps to Develop a Research

- **Specify the purpose or objective of research. (3)**
- It should explain the final conclusions that the research study hopes to reach.
- Start with a **general purpose**, then move to **specific purposes**.

Steps to Develop a Research

- **Determine specific research questions or hypotheses. (4)**
- “A research question is essentially a hypothesis asked in the form of a question”.
- “An hypothesis is a statement or explanation that is suggested by knowledge or observation but has not, yet, been proved or disproved.” (Macleod Clark J and Hockey L 1981)
- A problem cannot be scientifically solved unless it is reduced to hypothesis form.

Steps to Develop a Research

- **Data collection. (5)**
- The process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes.

Steps to Develop a Research

- **Consequences from improperly collected data include:**
 - Inability to answer research questions accurately
 - Inability to repeat and validate the study
 - Distorted findings resulting in wasted resources
 - Misleading other researchers to pursue fruitless avenues of investigation
 - Compromising decisions for public policy
 - Causing harm to human participants and animal subjects

Steps to Develop a Research

- Approaches that can preserve data integrity and ensure the scientific **validity** of study results are:
- Quality assurance - activities that take place *before* data collection begins
- Quality control - activities that take place *during* and *after* data collection

Each approach is implemented at different points in the research timeline
(Whitney, Lind, Wahl, 1998)

Steps to Develop a Research

- **Analyzing and interpreting the data. (6)**
- Data analysis and interpretation is the process of assigning meaning to the collected information and determining the conclusions, significance, and implications of the findings.

Analysis of *NUMERICAL (QUANTITATIVE) DATA*

- Represented in mathematical terms and include:
- **Mean:** represents a numerical average for a set of responses.
- **Standard deviation:** represents the distribution of the responses around the mean. It indicates the degree of consistency among the responses.
- **Frequency distribution:** indicates the frequency of each response.

Analysis of *NARRATIVE (QUALITATIVE) DATA*

- Conducted by organizing the data into common themes or categories.
- Strategies to analyze qualitative data:
- Focus groups and Interviews: read and organize the data from each question separately. Group the comments by themes, topics, or categories.
- Documents: Code content and characteristics of documents into various categories
- Observations: Code patterns from the focus of the observation

Effective Data Analysis

- Effective data analysis involves:
- keeping your eye on the main game
- managing your data
- engaging in the actual process of quantitative and / or qualitative analysis
- presenting your data
- drawing meaningful and logical conclusions

Steps to Develop a Research

- **Reporting and evaluating research. (7)**
- Organization
- Presentation

How to present a research PAPER as PRESENTATION

- <https://www.youtube.com/watch?v=9qGFh-XcuNk>



UNIVERSITY OF
LOUISIANA
SYSTEM
FOR YOUR FUTURE. FOR OUR FUTURE.

BRIDGING THE DIVIDE

Summer Series

RESEARCH LAB SAFETY

HOW TO KEEP A LAB NOTEBOOK

Dr. Jean Fotie

Department of Chemistry and Physics
Southeastern Louisiana University



OVERVIEW

- Generality of laboratory notebook**
- Selection of laboratory notebook**
- Notebook labelling**
- What should be recorded in the laboratory notebook**
- Who owns the laboratory notebook**
- Laboratory notebook ethics**
- Summary**



WHAT IS A LAB NOTEBOOK

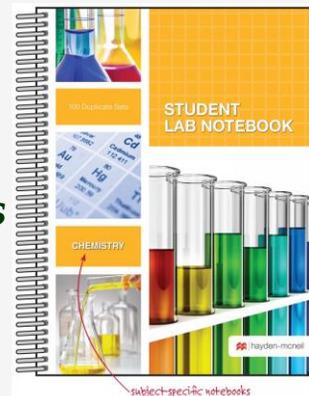
- ❑ *Written record of procedures, reagents, data, calculations, thoughts, explanations, and results of experiments*
- ❑ *Legal document used to defend intellectual property and accusations of fraud*
- ❑ *Knowledge for future researchers*
- ❑ *Support document for thesis and publications*

[Guidelines for keeping a laboratory notebook \(rice.edu\)](http://rice.edu)

[How to keep a lab notebook | Science | AAAS](#)

[tutorial LabNotebook V9.pdf \(columbia.edu\)](#)

[guide to keeping laboratory notebooks 2002 508.pdf \(nih.gov\)](#)





THE DISCOVERY OF HIV-1

- ❑ *1983: Luc Montagnier published a paper in Science, describing a retrovirus called LAV (lymphadenopathy associated virus), isolated from a patient at risk for AIDS.*
- ❑ *1984: Robert Gallo published a series of four scientific papers demonstrating that a retrovirus they had isolated (HTLV-III) was the cause of AIDS.*
- ❑ *1989: John Crewdson suggested that Gallo's lab might have misappropriated a sample of HIV isolated at the Pasteur Institute by Montagnier's group.*

[Robert Gallo and the Co-Discovery of HIV \(verywellhealth.com\)](http://verywellhealth.com)

[Crewdson, John \(1989-11-19\). "The Great AIDS Quest; Science under the microscope". \(Special section, 16 pp.\) Chicago Tribune.](#)



U.S. AND FRANCE END RIFT ON AIDS

Lawrence K. Altman (April 1, 1987)

President Reagan and Prime Minister Jacques Chirac of France ended a festering international scientific dispute today.

2008: The Nobel Prize for Medicine was awarded to French co-discoverers Françoise Barré-Sinoussi and Luc Montagnier, But Robert Gallo not included?

"And the Bank Played On" by Randy Shilts

[U.S. AND FRANCE END RIFT ON AIDS - The New York Times \(nytimes.com\)](http://www.nytimes.com)
[And the Band Played On \(1993\) \(imdb.com\)](http://www.imdb.com)





PHYSICAL LABORATORY NOTEBOOK

- ❑ *Paper laboratory notebooks*
- **Hard-cover, stitched binding**
- **Numbered pages**
- **Pages not easily removable**
- **Durable**



Leonardo Da Vinci



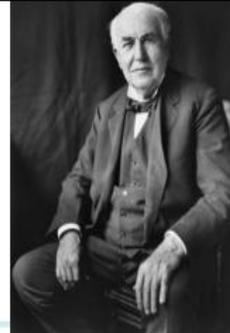
Dmitri Mendeleev



Marie Curie



Thomas Edison



MBIA | R

LAB NOTEBOOK IDENTIFICATION

- ❑ *Easy identification to the owner of the notebook*
- ❑ *Ability to easily reference collected data to a given entry in the corresponding notebook*
- ❖ *Use of name/initials of researcher, name of the project or a unique code*

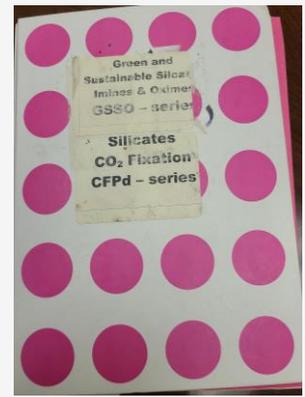
LAB NOTEBOOK

Your Name

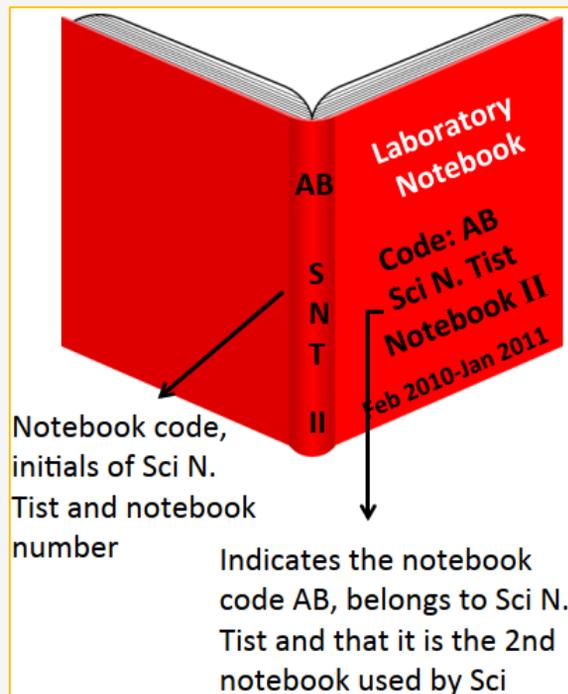
INTRO TO BIOTECH LAB

Professor's Name

Semester/Year



- ❑ *Label your notebook clearly with your full name on the front*
- ❑ *If multiple lab note books are need they may be numbered*
- ❑ *Indicate the dates notebook is used*
- ❑ *If the notebook is specific to a particular project, include on the front cover*



CONTENTS OF LABORATORY NOTEBOOK

- ❑ **Inside cover or cover page**
- ❖ *Period the lab notebook was used*
- ❖ *Project name(s)*
- ❖ *The address of the laboratory or office of researcher*
- ❖ *Table of contents*
- ❖ *Each page numbered and dated*

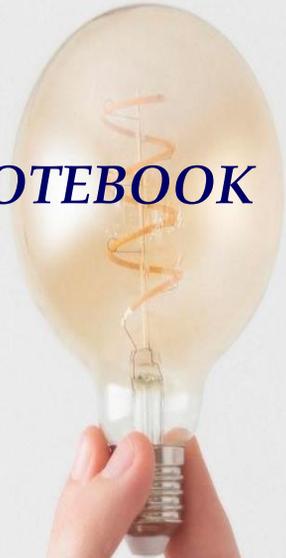


Table of content

Laboratory of Organic Chemistry	Page #	Dates	Title of the experiment
Southeastern Louisiana University	1	06/01/2018	Synthesis of oximes
Pursley Hall – SLU 10878	2	06/05/2018	Purification of ZnO ₂
Preparation of zinc nanoparticles	3	06/06/2018	Preparation of Zn nanoPs
From June 01, 2018 to July 27, 2019			
John Doe's lab notebook # 2			



UNIVERSITY OF
LOUISIANA
SYSTEM
FOR YOUR FUTURE. FOR OUR FUTURE.

BRIDGING THE DIVIDE

Summer Series



CLASS SCHEDULE			
Time:			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
DATE	EXPERIMENT	READ	DO
Jan 22 - Jan 28	Introduction, Safety Lecture and Test Fischer Esterification: Preparation of Benzocaine	Chapter - 1 Chapter - 2 P 759 - 763 (Sec. 20.1 - 20.2)	
Jan 29 - Feb 04		P 79 - 81 (Sec. 2.22) P 715 - 727 (Sec. 19.1 - 19.3)	P 764 - 765 (Miscscale) P 719 - 727, A (Miscscale) P 728 - 729, A (Miscscale)
Feb 05 - Feb 11	Grignard: Synthesis of Triphenylmethanol	P 499 - 500 (Sec. 15.1) P 528 - 533 (Sec. 15.5)	P 533 - 534, A (Miscscale)
Feb 12 - Feb 18	Relative Rates of Electrophilic Aromatic Substitutions (Completion of Grignard)	P 421 - 425 (Sec. 12.1 - 12.3) P 673 - 677 (Sec. 18.1 - 18.2)	P 428 - 429, B (Miscscale) P 678 - 679, A (no isomerization) (Miscscale)
Mar 03 - Mar 05	Diels-Alder Reaction	P 689 - 691 (Sec. 18.3)	P 691 - 692 (Miscscale)
Mar 10 - Mar 12	Wittig Reaction: Preparation of (Z) / (E) Stilbenes	P 36 - 41 (Sec 2.7 - 2.8) P 111 - 114 (3.3) On-Line	On-Line + Handout
Mar 17 - Mar 19	Aldol Condensation: Synthesis of <i>trans-p</i> -Anisalacetophenone ----- Start Unknowns: Complete Physical Properties and Solubility Tests		
Mar 24 - Mar 26	MID TERM EXAM		NOTEBOOKS DUE
Mar 27	LAST DAY TO	WITHDRAW	W/O PENALTY
Mar 31 - Apr 02	Unknowns Continued - Complete Classification Test	On-Line	On-Line
Apr 07 - Apr 09	Unknowns Continued - Complete Classification Test	On-Line	On-Line
Apr 21 - May 23	Unknowns Continued - Begin Synthesis of Derivatives	On-Line	On-Line
Apr 31 - May 02	Unknowns Continued - Complete Synthesis of Derivatives	On-Line	On-Line
May 05 - May 07	FINAL EXAM		NOTEBOOKS DUE

Table of Contents

Score	Experiment #	Experiment Name	Page
	1	Fischer Esterification: Preparation of Benzocaine	
	2	Grignard: Synthesis of Triphenylmethanol	
	3	Electrophilic Aromatic Substitutions (Completion of Grignard)	
	4	Diels-Alder Reaction	
	5	Wittig Reaction Preparation of (Z)/(E) Stilbenes	
	6	Aldol Condensation: Synthesis of <i>trans-p</i> -Anisalacetophenone	
		Start unknowns Complete Physical Properties & Solubility tests	

Gallup Organization: www.gallup.com
Search thousands of poll results, special reports,
societal trends and social audits.

Hoovers Business Research: www.hoovers.com
Comprehensive index of over 45,000 leading U.S.
private and public companies.

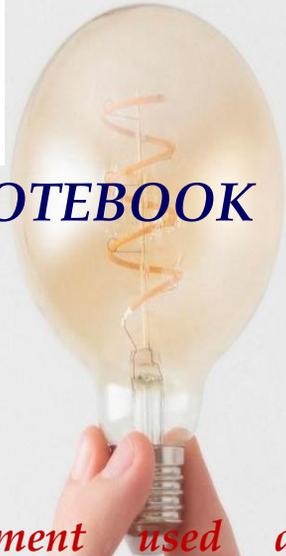
U.S. Department of Labor: <http://stats.bls.gov>
Bureau of Labor statistics site containing current
labor statistics and links to hundreds of state and
Federal agencies.

U.S. Federal Government: www.fedstats.gov
Statistical information from over 100 federal agencies.

CONTENTS OF LABORATORY NOTEBOOK

- ❑ *Date and titles each experiments*
- ❑ *Provide all the experimental details*
 - *Protocols, calculations, reagents, equipment used during experiments*
 - *Observations: anything planned or unplanned, raw data, permanently affixed with reference to data*
 - *Conclusions*

If multiple researchers using same notebook, name the author of each entry





BRIDGING THE DIVIDE

Summer Series

19 August 2013

Using the procedure outline on page 15 on this notebook.

However, using 30 mL- 50.0 mL of acetone (ACS grade, lot #123)

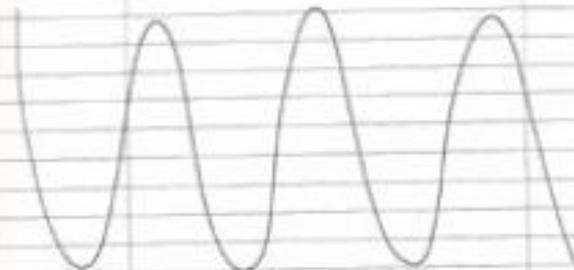
Observed the solution turned cloudy after 30 minutes stirring (40 rpm) at room temperature (~25°C)
After 1 hour of stirring, used roto-vap
At 100 rpm rotation with hot water bath set at 35 °C to remove extra solvent

Used spatula to transfer solid from flask to weigh paper and massed solid
Amount of product collected: 0.0156 g

27

Becher 08/19/13

Date	Subject	Page No.
9 Sept 1989	Preface	1
(Begin 10/19/89)	Table of abbreviations	2
10-Sept 1989	Determination of chloride by gravimetry	3
17 Sept 1989	Equivalent wt. of a solid acid	7
1 Oct 1989	Determ'n of oxalate by $KMnO_4$ titrimetry	10
2 Oct 1989	Fe in ore by dichromate titration	14
15 Oct 1989	The titration curve and ionization constants of phosphoric acid	20
5 Nov 1989	Potentiometry with quinhydrone electrode	26
12 Nov 1989	Formation constant of $Ag-NH_3$ complex	32
19 Nov 1989	Solubility of Ag_2CrO_4 by conductivity	39
4 Dec 1989	Controlled-potential coulometry	44
10 Dec 1989	Summary of Experimental Techniques I Learned this Semester	52

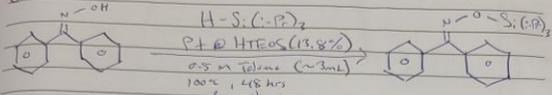




BRIDGING THE DIVIDE
Summer Series

9/24/19

GSSO-3



GSSO-1A	H Si (-P) ₂	(13.8% Pt) HTEOS	GSSO-3
mw: 197.23 $\frac{\text{g}}{\text{mol}}$	mw: 158.36 $\frac{\text{g}}{\text{mol}}$	mw: 195.1 $\frac{\text{g}}{\text{mol}}$	mw: 353.5 $\frac{\text{g}}{\text{mol}}$
n: 1.5201 mol	n: 1.825 mol	n: 1.52×10^{-5} mol	n: 1.5201 mol
m: 0.3g	m: 0.287g	mp: 2.97ms	mp: 0.537g
	d: 0.773 $\frac{\text{g}}{\text{mL}}$	mw: 21.5mg	mw: 0.211g
	v: 374 μL		y.y: 39.3%

Procedure:

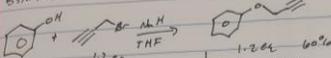
GSSO-1A & HTEOS were added to a round-bottom flask in stated amounts. ~3mL toluene was added as a solvent to reach 0.5M toluene. Trisopropylsilane was added to the flask in the stated volume. The flask was degassed with nitrogen for 30 mins (~3pm-3:30pm). The reaction was set in 100°C oil bath and allowed to proceed for 48hrs (3:30pm 9/24/19-3:30pm 9/26/19).

GC-MS showed potential reaction. Product was purified into 4 fractions. GC-MS of fraction 1 showed formation of product. GC-MS of fraction 4 showed retention of starting material (GSSO-1A). ¹H NMR of fraction showed

3:30pm

2-24-19

BSR7-6A

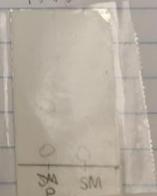


Phenol	Propargyl Bromide	Sodium Hydride	BSR7-6A
mw: 94.11 $\frac{\text{g}}{\text{mol}}$	mw: 178.96 $\frac{\text{g}}{\text{mol}}$	mw: 24.00 $\frac{\text{g}}{\text{mol}}$	mw: 132.16 $\frac{\text{g}}{\text{mol}}$
mp: 7.21 $^\circ\text{C}$	M: 10.81g	n: 0.908 mol	mp: 10g
mp: 107.57	d: 1.57 $\frac{\text{g}}{\text{mL}}$	M: 3.632g	nexp: 0.757 mol
	V: 7.4 mL @ 0.88 mL		% yield: 41.5%
	n: 0.908 mol		mw: 4.150g

Procedure

Phenol and Propargyl Bromide were combined in a 500 mL RBF in THF. The flask was put on ice and the sodium hydride was added slowly. Reaction was stirred strongly until the reaction slowed down. The flask was removed from ice and allowed to run at room temperature

H_{1c}: 67.04C
9.5.0.9



100
200
300
400

Print Date: 08 Nov 2019 15:07:25

MS Data Review All Plots - 11/8/2019 3:07 PM

File: C:\chem\ms\data\081019\gscda2_2_11.dioxane.ms

Operator:

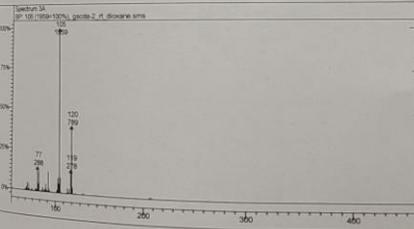
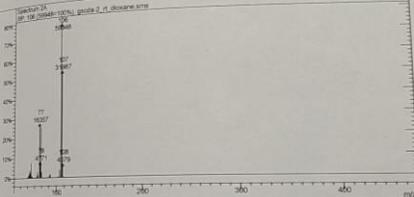
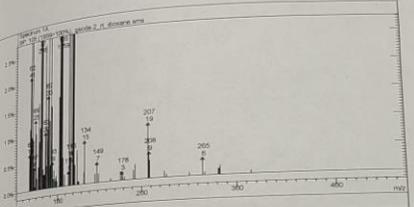
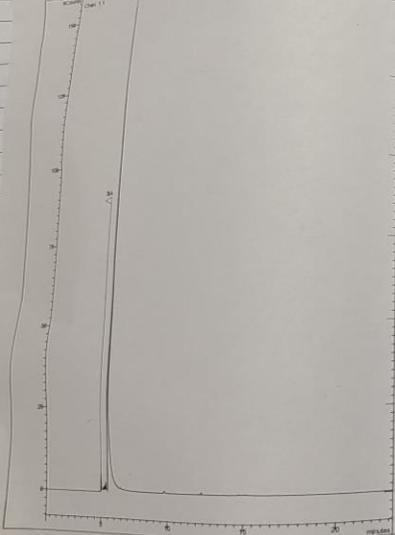
Date: 11/8/2019 2:40 PM

CGCDA-2_11_DIOXANE.SMS Chan: 1

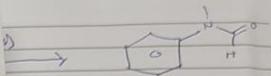
Sample:

Scan Range: 1 - 2295 Time Range: 0.00 - 76.00 min

Chen: 11



11/7/19



~6ml

ml %

(13.8%P)	GSCDA-2
5.1 g/ml	ms: 135.16 g/mol
996 x 10 ⁶ mol	n: 2.7496 mol
462 mg	mp: 0.37 Kg
37 mg	mass
	obj:

1 to B.F.F. ~6ml dioxane
 SiEt₃ added. CO₂
 24 hrs @ RT.
 material w/ trace



TIPS FOR NOTEBOOK HOUSEKEEPING

- Use an ink pen (not Pencil) to write in notebook*
- Write as you go: do not write important results on scratch paper*
- In a case of error or mistake, draw a single line through errors, and re write the correct information*
- Never use white-out or blackout to fix errors*
- Complete notebook entries in consecutive page order, avoid blank pages.*



TIPS FOR NOTEBOOK HOUSEKEEPING

- Begin new experimental entries on a new page*
- Avoid empty spaces in the lab notebook – When not avoidable, cross out any unused blank space and pages*
- Do not remove pages from the notebook*
- Sign/date at the end of each page. Some institutions require a witness or a direct supervisor to cosign entries, at the end of each day or each week.*



A LAB NOTEBOOK IS NOT...

- A journal*
- A record of communications*
- A place to compile*
- *lab protocols/manuals*
- *Hypothesis/goals/specific aims*
- *Background information*
- *Yours to take home*



SELECTING A LABORATORY NOTEBOOK

Electronic lab notebook (ELN)

- *Strong and easy to use note-taking capabilities*
- *“Secured” and Easily navigable*
- *Allows for imbedded data and images*
- *Easy link between pages*
- *Lock notebook pages*
- *Secure login*
- *Audit trail – timestamp for changes and by whom*
- *Allows for witness signatures*
- *Ability to easily export information in different file types*



UNIVERSITY OF
LOUISIANA
SYSTEM
FOR YOUR FUTURE. FOR OUR FUTURE.

BRIDGING THE DIVIDE

Summer Series

Evernote

Search notes

Table of Contents

Tags

Sample tags

Linked files

Link to other pages

Linked file "Quick Look"

EB-35 EB-34 Sheet1

10-Fluorescence Measurements to measure DNA binding - MM-streptavidin

- Compare binding to streptavidin-coated particles
- Procedure:
 - Coupling: **Linked files**
 - Particle concentrations and standards: **Linked file "Quick Look"**
 - Particles: EB-35
- Experiment: [Page 35 - 1-Subject Notebook 2](#) **Link to other pages**
- Results:
 - Fluorometer: **Linked file "Quick Look"**
- Analysis:
 - EB-35.pzfx 14.1 KB
 - There may be a problem
 - Concentration bound

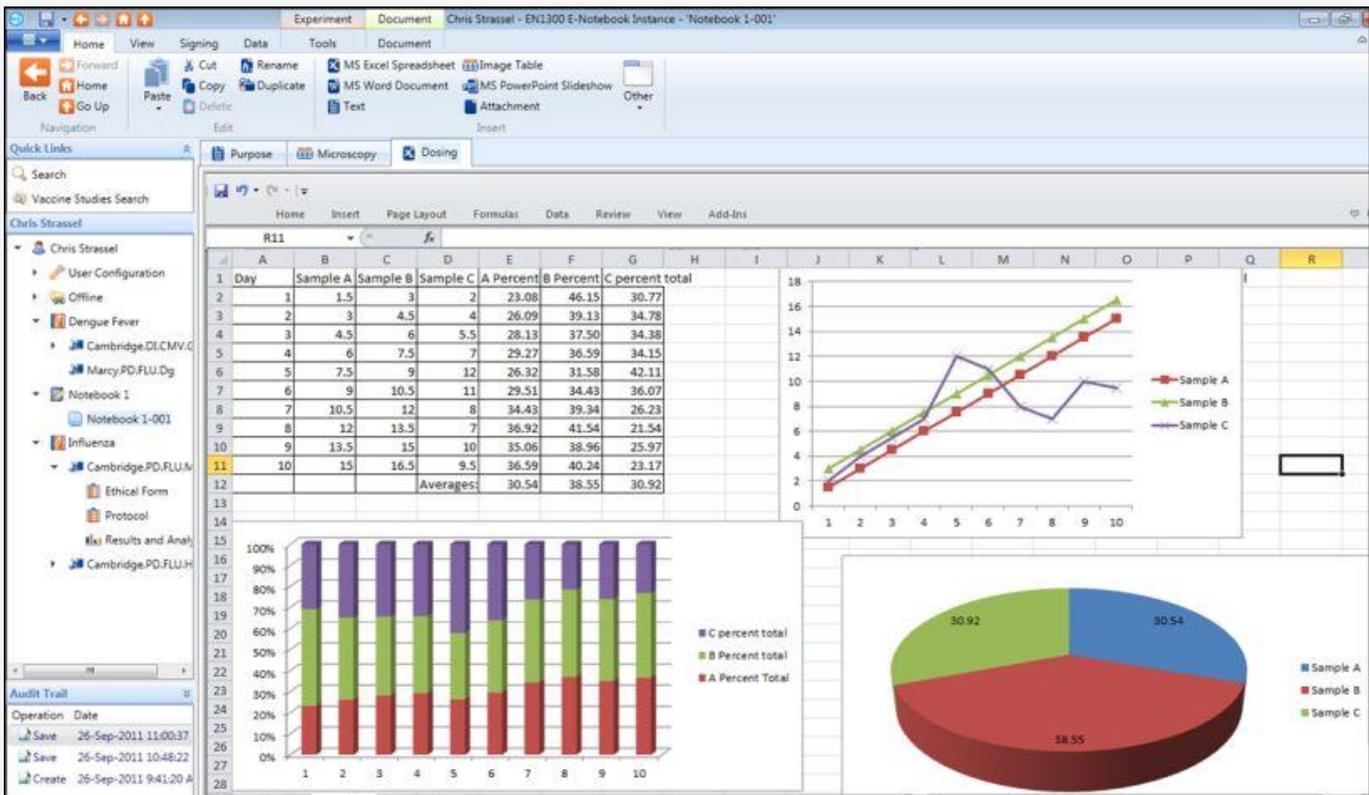
	3	4	5	6	7	8	9	0	0.05	0.1
0 A	306	303	284	367	10	9	4			
1 B	23	19	19	26	107	122	85	4		
2 C	7085	7103	6354	5445	185	227	164	11		
3 D	9	7	5	7	224	271	211	21		
4 E	6	8	6	5	283	273	235	21		
6 F	10	10	10	6	574	617	413	45		
8 G	11	10	12	9	647	647	474	51		
10 H	11	9	9	8	429	490	531	61		



UNIVERSITY OF
LOUISIANA
SYSTEM
FOR YOUR FUTURE. FOR OUR FUTURE.

BRIDGING THE DIVIDE

Summer Series





NOTEBOOKS – ADVANTAGES & DISADVANTAGES

Type of Notebook	Advantages	Disadvantages
Bound/Stitched	No lost pages, legally stronger	Difficult to copy, not logically organized, requires references to data stored elsewhere
Loose Leaf / Binder	Organized by experiment, data stored together	Sheets fall out, difficult to authenticate as pages can be added as needed.
Computer / Electronic	Easy to search, easy to read, Easy to store, available from different locations	Requires electronic security, files could be easily corrupted, Software compatibility issue, potential cyberattack



WHO OWNS THE LABORATORY NOTEBOOK

- The institution where the experiments are conducted are the owners of the lab notebooks*
- As a researcher, your responsibility is to maintain an intelligible notebook, for yourself, your PI, and for future lab members*
- Laboratory notebooks should never leave the laboratory*

Some institutions allow for a researcher to have a secondary lab notebook or a journal for daily summaries and keys information a researcher might need when away from the lab



INTELLECTUAL PROPERTY

- Laboratory notebook is a proof of intellectual property*
- The entry pages should also be signed, dated, and have a person witness the invention*
- List all co-inventors*
- Unless specifically waived, the University or company where the experiments were performed, and/or where the idea was originated holds the intellectual property rights to patentable inventions and discoveries, and any associated technology resulting primarily from the use of its facilities.*



LABORATORY NOTEBOOK ETHICS

- All data needs to go into notebook, even the result from unsuccessful experiments*
- Pages should not be removed from the lab notebook. Simply draw a line through error and provide the corrected version.*
- Record facts, not opinions (ex: no reaction occurred under these experimental conditions vs. this reaction will never work!)*
- Be honest!*



REFERENCES

- ❑ *[Guidelines for keeping a laboratory notebook \(rice.edu\)](#)*
- ❑ *[How to keep a lab notebook | Science | AAAS](#)*
- ❑ *[tutorial LabNotebook V9.pdf \(columbia.edu\)](#)*
- ❑ *[guide to keeping laboratory notebooks 2002 508.pdf \(nih.gov\)](#)*