Praktikum aus Chemischer Technologie

Anorganischer Stoffe WS16/17

Outline

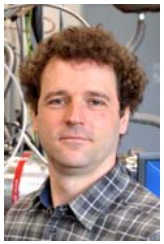
- People – Mitarbeiter
- Short examples – Kurzbeispiele
- Technological work – Technologische Arbeiten
- Personal evaluation – Bewertung
- Scientific paper / report – Protokoll der techn. Arbeit
- Safety regulations – Sicherheitsbestimmungen

Institut für Chemische Technologie Anorganischer Stoffe

- Univ. Prof. Dr. Achim Walter Hassel

- Assist.-Prof. Dr. Cezarina Mardare

- Assoc.-Prof. Dr. Andrei Mardare



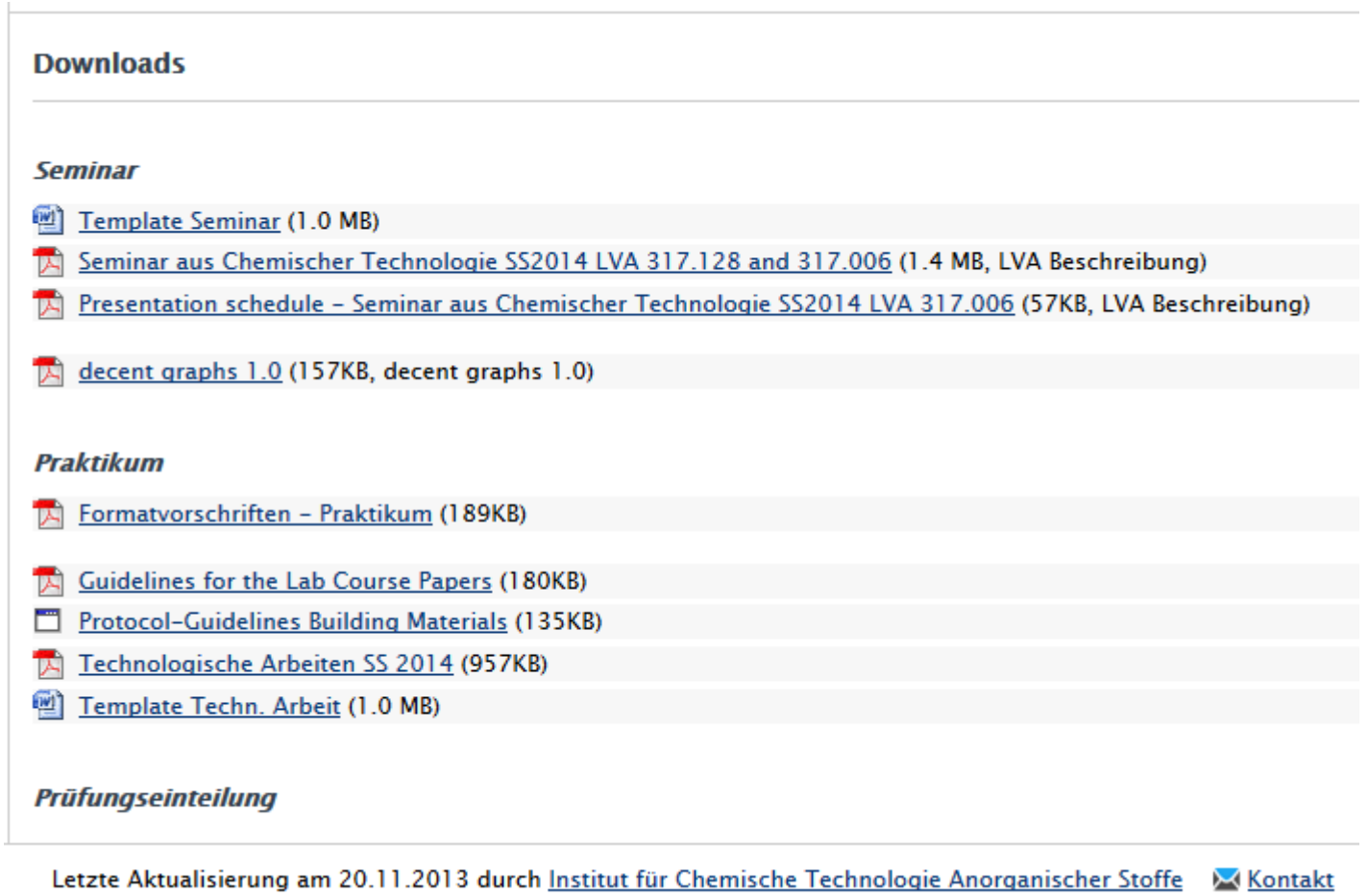
- Dipl.-Chem. Dr. Jan Kollender

Institut für Chemische Technologie Anorganischer Stoffe

- Dipl.-Ing.in Silvia Huber
- Dipl.-Ing.in Isabella Pötzelberger
- Dipl.-Ing.in Carina Grill
- Dipl. Ing. Georg Otto Hölzl
- M.Sc. Melinda Krebsz

Student help - Guntner Armin Sebastian

ICTAS Webpage - http://www.jku.at/ictas/content
Downloads – Password: ictas



Downloads

Seminar

- Template Seminar (1.0 MB)
- Seminar aus Chemischer Technologie SS2014 LVA 317.128 and 317.006 (1.4 MB, LVA Beschreibung)
- Presentation schedule – Seminar aus Chemischer Technologie SS2014 LVA 317.006 (57KB, LVA Beschreibung)
- decent graphs 1.0 (157KB, decent graphs 1.0)

Praktikum

- Formatvorschriften – Praktikum (189KB)
- Guidelines for the Lab Course Papers (180KB)
- Protocol-Guidelines Building Materials (135KB)
- Technologische Arbeiten SS 2014 (957KB)
- Template Techn. Arbeit (1.0 MB)

Prüfungseinteilung

Letzte Aktualisierung am 20.11.2013 durch Institut für Chemische Technologie Anorganischer Stoffe Kontakt

Feature: English Language - Optional

- Communicate in English
  - Learn scientific vocabulary
  - Discuss a scientific topic
- Write a scientific paper in English
  - Learn the scientific format
  - Get accustomed with written expressions

Certificate (Zeugnis)

JOHANNES KEPLER UNIVERSITY LINZ | JKU

Institut für Chemische Technologie Anorganischer Stoffe

ICTAS

This is to certify that

Wolfgang Amadeus Mozart

born on **January 27th 1756** in **Austria**

has chosen to fulfill the requirements and complete the labcourse
"Chemical Technology of Inorganic Materials" offered by
The Institute for Chemical Technology of Inorganic Materials
in **English**

Technological thesis title: "Die Entführung aus dem Serail"

Univ. Prof. Dr. Achim Walter Hassel

⊞	1	R	**Mon. 03.10.2016**	12:00 - 17:00	T 111	Info-event concerning all lectures + AT start lecture+ Workshop Error calculus
⊞	2	R	**Tue. 04.10.2016**	12:00 - 17:00	T 111	Workshop cos law + Begin KB1
⊞	3	R	**Wed. 05.10.2016**	12:00 - 16:15	T 111	Workshop XRD, Photography, Origin
⊞	4	R	**Mon. 10.10.2016**	12:00 - 17:00	T 111	
⊞	5	R	**Tue. 11.10.2016**	12:00 - 17:00	T 111	
⊞	6	R	**Wed. 12.10.2016**	12:00 - 16:15	T 111	TA1 proposal 5 min presentation - may change!!!
⊞	7	R	**Mon. 17.10.2016**	12:00 - 17:00	T 111	
⊞	8	R	**Tue. 18.10.2016**	12:00 - 17:00	T 111	
⊞	9	R	**Wed. 19.10.2016**	12:00 - 16:15	T 111	End KB1
⊞	10	R	**Mon. 24.10.2016**	12:00 - 17:00	T 111	Start TA1
⊞	11	R	**Tue. 25.10.2016**	12:00 - 17:00	T 111	
⊞	12	R	**Mon. 31.10.2016**	12:00 - 17:00	T 111	
⊞	13	R	**Mon. 07.11.2016**	12:00 - 17:00	T 111	
⊞	14	R	**Tue. 08.11.2016**	12:00 - 17:00	T 111	
⊞	15	R	**Wed. 09.11.2016**	12:00 - 16:15	T 111	
⊞	16	R	**Mon. 14.11.2016**	12:00 - 17:00	T 111	
⊞	17	R	**Tue. 15.11.2016**	12:00 - 17:00	T 111	
⊞	18	R	**Wed. 16.11.2016**	12:00 - 16:15	T 111	KB1 protokole deadline
⊞	19	R	**Mon. 21.11.2016**	12:00 - 17:00	T 111	
⊞	20	R	**Tue. 22.11.2016**	12:00 - 17:00	T 111	
⊞	21	R	**Wed. 23.11.2016**	12:00 - 16:15	T 111	End TA1 + Lab clean day
⊞	22	R	**Mon. 28.11.2016**	12:00 - 17:00	T 111	Start KB2
⊞	23	R	**Tue. 29.11.2016**	12:00 - 17:00	T 111	
⊞	24	R	**Wed. 30.11.2016**	12:00 - 16:15	T 111	TA2 proposal 5 min presentation - may change!!!
⊞	25	R	**Mon. 05.12.2016**	12:00 - 17:00	T 111	
⊞	26	R	**Tue. 06.12.2016**	12:00 - 17:00	T 111	
⊞	27	R	**Wed. 07.12.2016**	12:00 - 16:15	T 111	
⊞	28	R	**Mon. 12.12.2016**	12:00 - 17:00	T 111	TA1 paper deadline
⊞	29	R	**Tue. 13.12.2016**	12:00 - 17:00	T 111	
⊞	30	R	**Wed. 14.12.2016**	12:00 - 16:15	T 111	End KB2
⊞	31	R	**Mon. 09.01.2017**	12:00 - 17:00	T 111	Start TA2
⊞	32	R	**Tue. 10.01.2017**	12:00 - 17:00	T 111	
⊞	33	R	**Wed. 11.01.2017**	12:00 - 16:15	T 111	
⊞	34	R	**Mon. 16.01.2017**	12:00 - 17:00	T 111	
⊞	35	R	**Tue. 17.01.2017**	12:00 - 17:00	T 111	

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UNIVERSITÄT LINZ

The tutorials take place at the same time for both groups!!!

The Final Presentation dates need to be fixed. Please check KUSSS!

?????????

Short Examples

Kurzbeispiele

Timetable – Zeitplan

- Period – Dauer 2 wks
- Short examples - Kurzbeispiele Protokolle Deadline !
- 15 Euro / key – Schlüssel
- Short questions before experiments
  - fail twice and you're out!

Short examples - Kurzbeispiele

- ***Metallography - Metallurgie und Metallographie***
  - Sample preparation – embedding, grinding

    Probenpräparation – Einbetten, Schleifen
  - Grain analysis – optical microscopy

    Analyse der Körner - Mikroskopie
  - Thin film deposition – Al thermal evaporation

    Dünnschichtabscheidung – thermische Verdampfung von Al

- **Keywords**
  - Härtebestimmung nach Rockwell und Vickers
  - Prinzip Zugversuch
  - Thermisches Verdampfen von Al

Short examples - Kurzbeispiele

- ***Ni electrodeposition - Elektrolytische Ni Abscheidung***
  - Nickel electroplating

    Galvanisch Vernickeln
  - Evaluation of Nickel electrolyte solution

    Untersuchung des Nickel Elektrolyten
  - XRD

Short examples - Kurzbeispiele

- ***Scientific Technical Photography and Microscopy***

  Wissenschaftlich-Technische Fotografie

  - Planning a Photographic Documentation

    Planung einer fotografischen Dokumentation

  - Realisation and Documentation

    Durchführung und Dokumentation

Keywords

- Tiefenschärfe, Schärfentiefe
- Farbtreue, Beleuchtung
- Direkte, indirekte Reflexionen
- Maßstab

S. Huber

Technological work

Technologische Arbeiten

Timetable – Zeitplan

- Concept proposals Deadline and 5 min presentation - Schlusstermin für Konzept und 5 min Präsentationen: KUSSS
- Period – Zeitplan: KUSSS
- Technologische Arbeiten Paper Deadline: KUSSS
- Technologische Arbeiten Presentations – Präsentationen: KUSSS
- 10 min + Discussion

Technologische Arbeiten

1. Nickel recycling

- Literature survey about recovery of nickel from waste waters / sludges
- Recovery of Nickel from galvanic waste water as $NiSO_4$
- Analysis of the recovered material - XRD, XRF, etc.

- Literatur
- Nickel Rückgewinnung aus NiSO4 Abfall
- XRD, XRF, etc.

Technologische Arbeiten

2. „Smart glass“ – Electrochromic Prussian blue

- Fabrication of PB coated ITO glass (e.g. dip-coating)
- Application test: Cyclic voltammetry, observation of color change + determination of PB coating thickness
- Characterization - XRD

- Herstellung von PB-beschichtetem ITO-Glas
- Anwendungstest: Cyclovoltammetrie, Beobachtung der Farbänderung + Bestimmung der PB-Schichtdicke
- Charakterisierung - XRD

Technologische Arbeiten

3. Synthesis of Mo-W oxides

- literature research
- chemical synthesis of powders with different morphologies
- XRD and SEM/EDX characterization

- literature research
- chemical synthesis of powders with different morphologies
- XRD and SEM/EDX characterization

Technologische Arbeiten

4. Galvanostatic anodic oxides on aluminium

- literature research
- surface preparation, current density, electrolytes
- setup of apparatus & experiments

- Literatursuche
- Aufbau&Experimente

Technologische Arbeiten

5. Synthesis of deuterol zincate vs. hydrozincate

- Literature research (synthesis, band positions and correlation)
- Synthesis of deuterol zincate and hydrozincate
- Analysis of the corrosion products with various techniques (e.g. IR, Raman)

- Literatursuche (Syntheseweg, Bandenpositionen- und zuordnung im IR und Raman Spektrum)
- Synthese von Tetrahydroxyzincate (in klassischer und deuterierter Form)
- Analyse der Korrosionsprodukte mit verschiedenen Techniken (z.B. IR Spektroskopie)

Technologische Arbeiten

6. Preparation of heavy water by distillation

- Literature research
- Enrichment of heavy water by distillation
- Analysis of the distillation product

- Literatursuche
- Anreicherung von schwerem Wasser
- Analyse des Destillationsproduktes

Technologische Arbeiten

7. Spray drier

- revival of the equipment
- testing with production of Mo-W-oxides (literature research)
- characterization: XRD and SEM/EDX

- revival of the equipment
- testing with production of Mo-W-oxides (literature research)
- characterization: XRD and SEM/EDX

Technologische Arbeiten

8. Cavitation corrosion of iron with subsequent solution analysis

- literature research
- experimental conditions, electrolyte, titration procedure
- setup of apparatus & experiments

- Literatursuche
- Aufbau
- Experimente

Technologische Arbeiten

9. Photoelectrochemistry on anodic Ti thin films

- literature research
- surface preparation, anodisation conditions, light source, I&V measurements
- setup of apparatus & experiments

- Literatursuche
- Aufbau
- Experimente

Technologische Arbeiten

10. Preparation and investigation of special ceramic (slip casting) and glaze

- Investigation of various ratios for slip casting (ratios kaolin : feldspath : silica)
- Investigation of different mixtures for glaze
- Effect of calcination temperature
- Hardness

- Untersuchung unterschiedlicher Zusammensetzung des Schlickergusses und Glanzes (Kaolin:Feldspat:Silikat)
- Einfluss der Brenntemperatur
- Härtemessung

Name	TA
Blasche Stefan	***heavy water***
Dema Mirsime	***Nickel recycling***
Demirbilek Zafer	***Mo-W***
Kisling Thomas	***galv alumina***
Pflügl Magdalena	***slip casting***
Vsetecka Lisa	***Photo Ti***
Weiß Katharina	***smart glass***
Wallergraber Christoph	***cavitation Fe***
Zelenka Karl	***spray drier***
Winter Michael	***deuterol zincate***

Contact your supervisors!

Supervisors	TA
C. Grill	***Nickel recycling***
C. Grill + I. Pötzelberger	***smart glass***
G. Hölzl	***deuterol zincate***
S. Huber + M. Krebsz	***cavitation Fe***
J. Kollender + A. Mardare	***Photo Ti***
C. Mardare + M. Krebsz	***Mo-W***
J. Kollender + A. Mardare	***galv alumina***
S. Huber + M. Krebsz	***heavy water***
C. Mardare + A. Mardare	***spray drier***
C. Grill	***slip casting***

Technologische Arbeiten

1. Bimetallic metal alloys as biosensors for nonenzymatic glucose detection

- literature research (CuNi, NiZn, CuPd ...)
- electrocatalytic reactions using various electrolyte solutions
- influence of the electrolyte pH (pH 7-13)

- Literatursuche (CuNi, NiZn, CuPd, ...)
- Untersuchung elektrokatalytische Reaktionen unter Verwendung unterschiedlicher Elektrolyten
- Einfluss des pH Wertes (pH 7-13)

Technologische Arbeiten

2. Sol-gel synthesized WO_3

- literature review
- Sol-gel synthesis from varying WO_3 sol compositions
- Characterization (SEM, EDX,...)

- Literatursuche
- Synthese von WO_3 und Variation der Zusammensetzung
- Charakterisierung (SEM, EDX,...)

Technologische Arbeiten

3. Synthesis of Mn-V oxides

- literature research
- chemical synthesis of powders with different morphologies
- XRD and SEM/EDX characterization

- literature research
- chemical synthesis of powders with different morphologies
- XRD and SEM/EDX characterization

Technologische Arbeiten

4. Synthesis of metallic nanoparticles - Cu-Ag, Cu-Pd

- literature research
- chemical and/or hydrothermal synthesis
- characterization: XRD and SEM/EDX

- literature research
- chemical and/or hydrothermal synthesis
- characterization: XRD and SEM/EDX

Technologische Arbeiten

5. Combinatorial development of corrosion inhibitors

- Literature research (corrosion, inhibitors, synthesis and application of corrosion inhibitors)
- Synthesis of corrosion inhibitors, corrosion test
- Analysis of efficiency of the applied corrosion inhibitors

- Literatursuche (Korrosion, Korrosionsinhibitoren, Synthese und Anwendung von Korrosionsinhibitoren)
- Synthese, Korrosion test
- Wirksamkeitsanalyse der Korrosionsinhibitoren

Technologische Arbeiten

6. Cavitation erosion of nickel with subsequent solution analysis

- literature research
- experimental conditions, electrolyte, titration procedure
- setup of apparatus & experiments

- Literatursuche
- Aufbau
- Experimente

Technologische Arbeiten

7. Investigation of green corrosion inhibitors

- Literature survey
- Investigation of “green” corrosion inhibitors by polarization curves
- Investigation of inhibitor effect for different metals
- Temperature / Concentration influence

- Literatursuche
- Untersuchung von umweltfreundlichen Korrosionsinhibitoren mittels Polarisationskurven
- Untersuchung dieser für unterschiedliche Metalle
- Temperatur-/Konzentrationseinfluss

Technologische Arbeiten

8. Photoelectrochemistry on anodic Nb thin films

- literature research
- surface preparation, anodisation conditions, light source, I&V measurements
- setup of apparatus & experiments

- Literatursuche
- Aufbau
- Experimente

Technologische Arbeiten

9. Anodic oxides on plastic substrates

- literature research
- Al thin film deposition, anodisation conditions, electrolytes
- setup of apparatus & experiments

- Literatursuche
- Aufbau
- Experimente

Technologische Arbeiten

10. Ti-alloys - galvanostatic anodization

- literature research
- surface preparation, current density, electrolytes
- setup of apparatus & experiments

- Literatursuche
- Aufbau
- Experimente

Name	TA
Danner Christian	***cavitation Ni***
Göpperl Lukas	***galv titania***
Haderer Verena	***WO3***
Hammerschmid Georg	***photo Nb***
Kneidinger Michael	***green corr inhib***
Krisch Dominik	***corr inhib***
Pernusch Daniel	***alumina on plastic***
Schiffmann Lukas	***Cu-Ag, Cu-Pd***
Timelthaler Daniel	***Mn-V***
Traxler Ines	***biosensors***

Contact your supervisors!

Supervisors	TA
I. Pötzelberger + A. Mardare	***biosensors***
S. Huber + C. Mardare	***WO3***
A. Mardare + J. Kollender	***alumina on plastic***
C. Mardare + C. Grill	***Cu-Ag, Cu-Pd***
C. Mardare + M. Krebsz	***Mn-V***
J. Kollender + A. Mardare	***galv titania***
S. Huber + C. Mardare	***corr inhib***
S. Huber + M. Krebsz	***cavitation Ni***
C. Grill + I. Pötzelberger	***green corr inhib***
J. Kollender + A. Mardare	***photo Nb***

General rules

Generelle Regeln

- The timetable of the lab is INVARIABLE: Mo – Mi, 12^{00} – 17^{00}(16^{15})

  Zeitplan des Praktikums INVARIABEL: Mo – Mi, 12^{00} – 17^{00}(16^{15})

- You must use the Safety Presence List - Always check the Infoboard!

  Bitte tragt euch täglich in der Anwesenheitsliste ein!

- All doors from the Lab MUST always be Unlocked

  Die Türen des Praktikumssaals müssen immer aufgesperrt sein

- Clean your workspace on a daily basis

  Der Arbeitsplatz ist täglich zu reinigen

  - Glassware must always be labeled with: Student name, Date, Chemical name

    Bechergläser/Kolben müssen mit Name, Datum, Inhalt beschriftet sein

  - Dispose of your chemicals at the end of the Praktikum at latest

    Chemikalien sind spätestens am Ende des Praktikums zu entsorgen

  - Always clean the balance after use (brush)

    Die Waage ist nach jeder Nutzung zu reinigen (Pinsel)

- Ultrasonic bath usage – Always close the fume hood window for sonic protection

  Ultraschallbad – Bei Benutzung ist der Abzug zu schließen

- Arc melting usage – Always close the door when using the furnace and announce that you are using it

  Lichtbogenofen – Alle Labortüren sind bei Benutzung geschlossen zu halten und die Benutzung ist stets anzukündigen

- Access to other Labs is strictly forbidden (Lab tour available by request)

  Das Betreten anderer Laboratorien ist verboten (Laborführung auf Nachfrage)

- Save your computer files with appropriate names

  Daten sind wie folgt auf dem PC zu speichern

  - Folder – Date, Family name (20110100 Mardare), suggestive file name

    Ordner – Datum, Nachname (20110100 Mardare), Dateiname

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JOHANNES KEPLER
UNIVERSITÄT LINZ

A few suggestions on how to prepare decent graphs and figures

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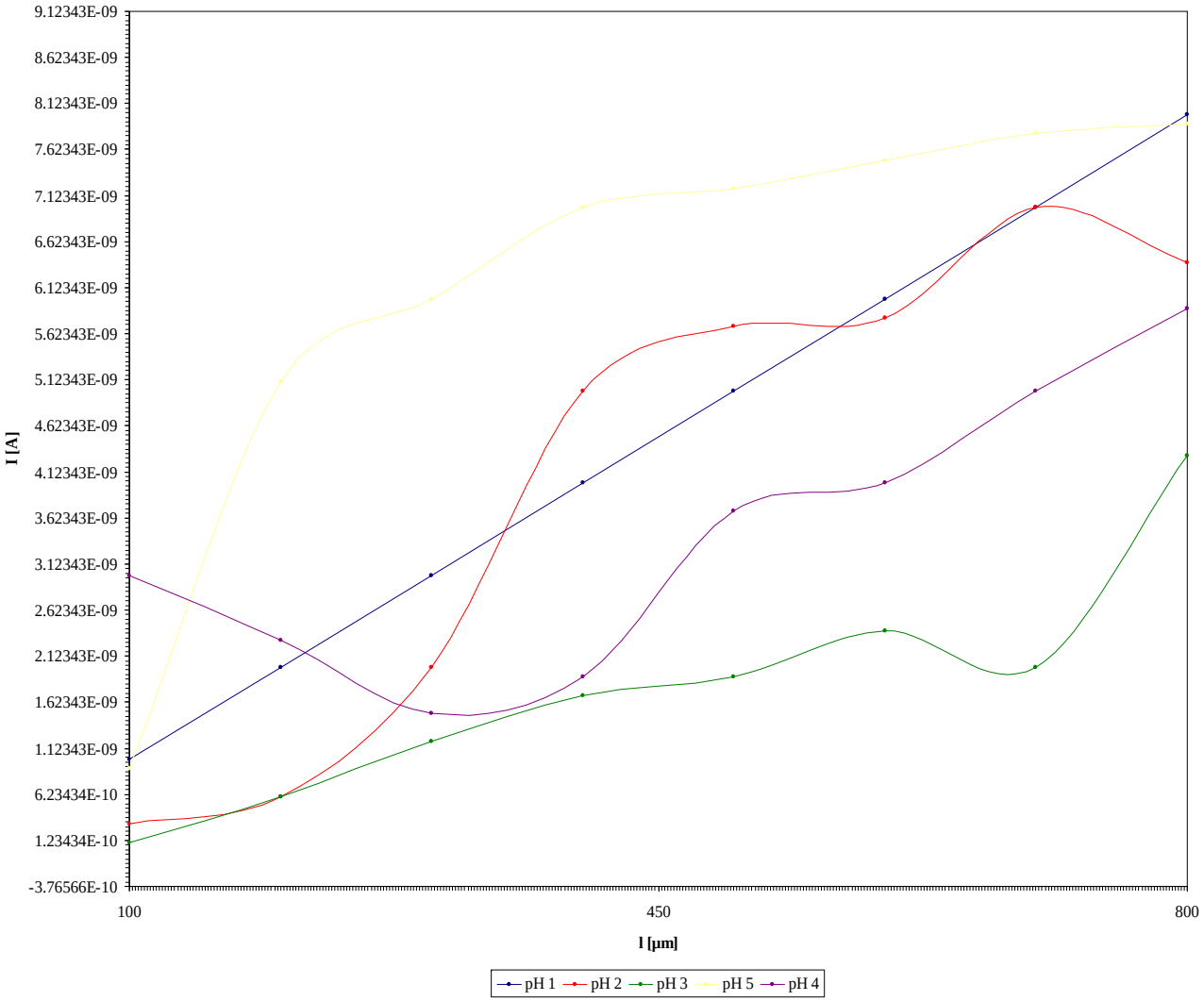
Empfehlungen zur Erstellung von Graphen und Abbildungen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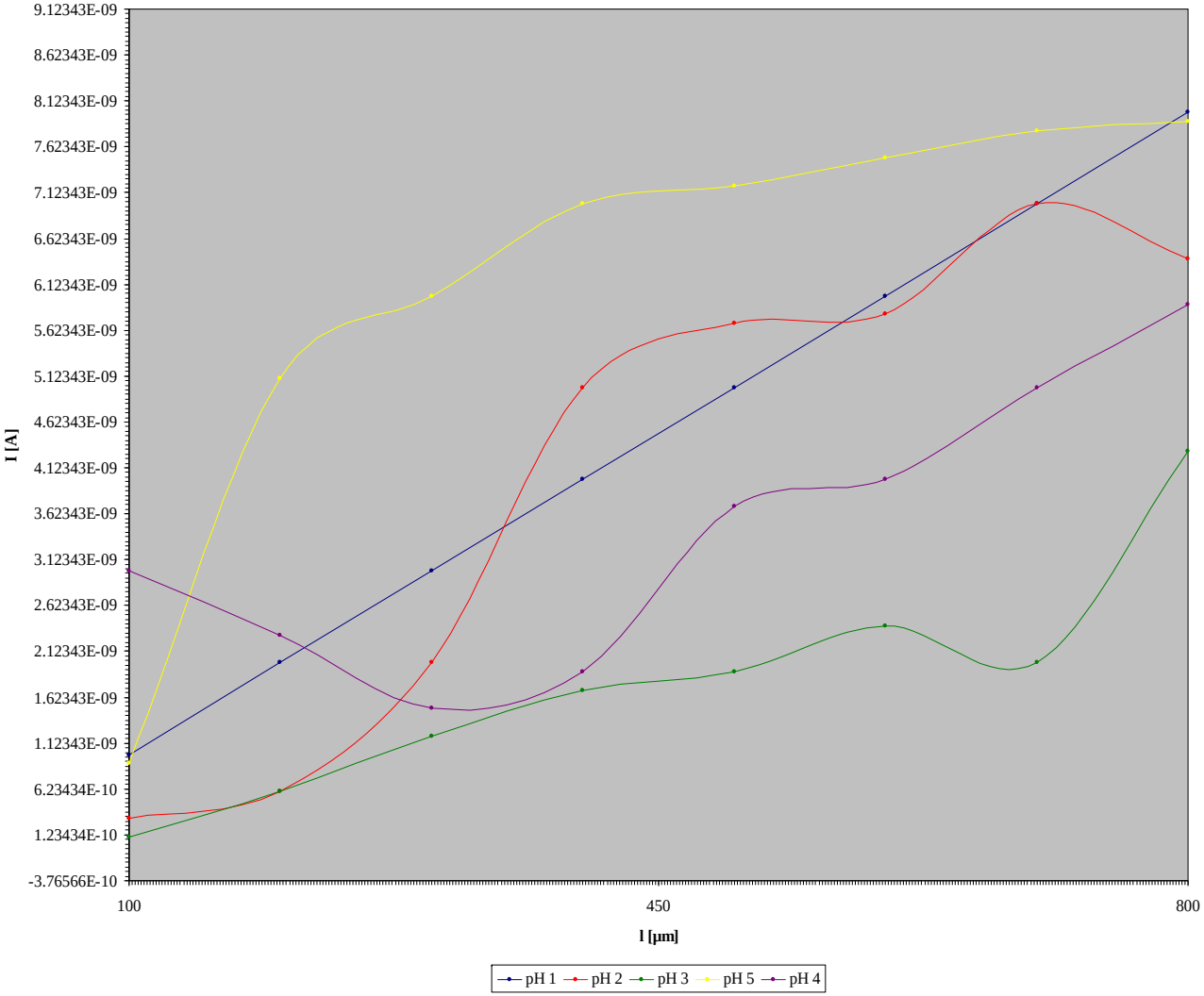
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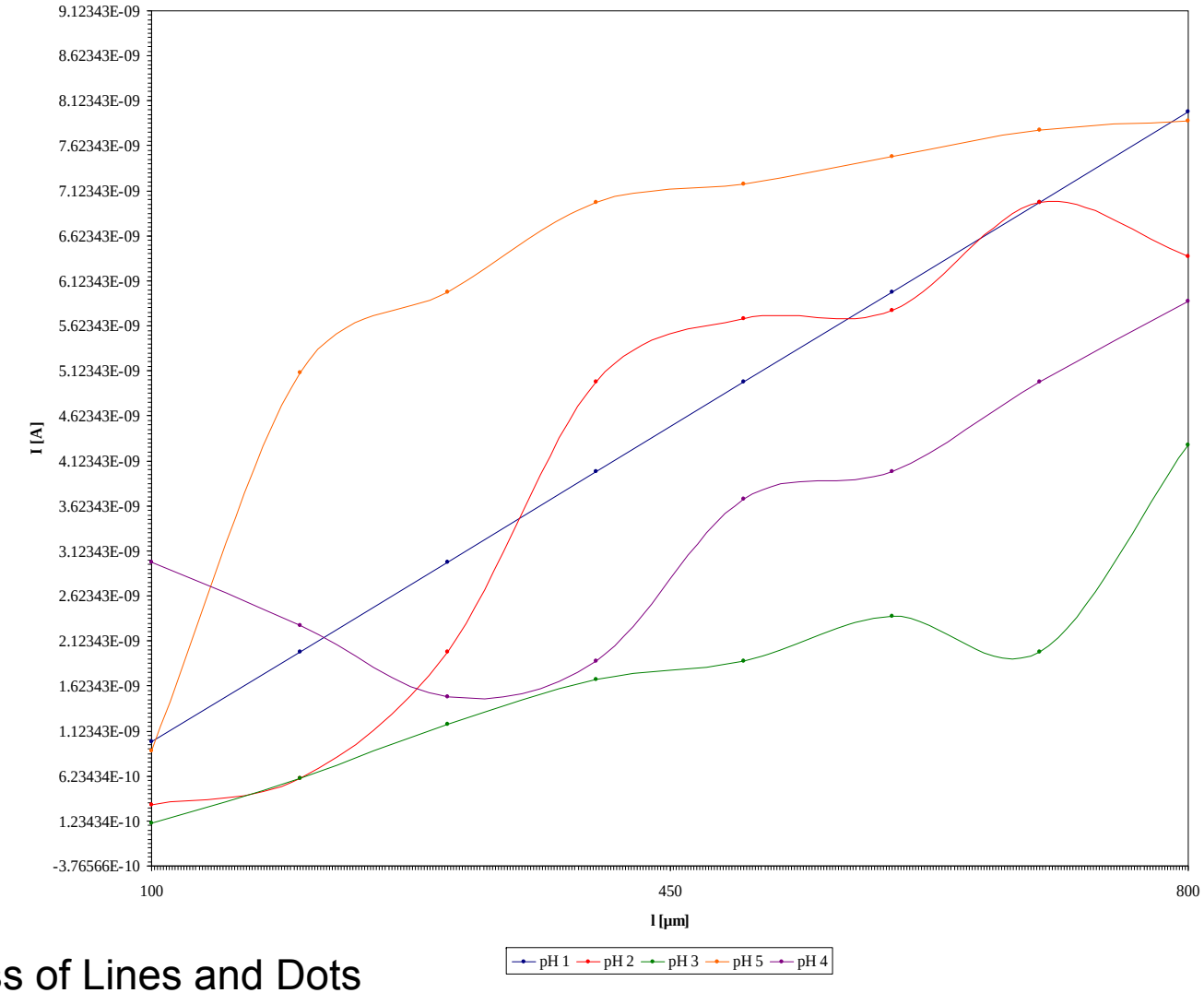
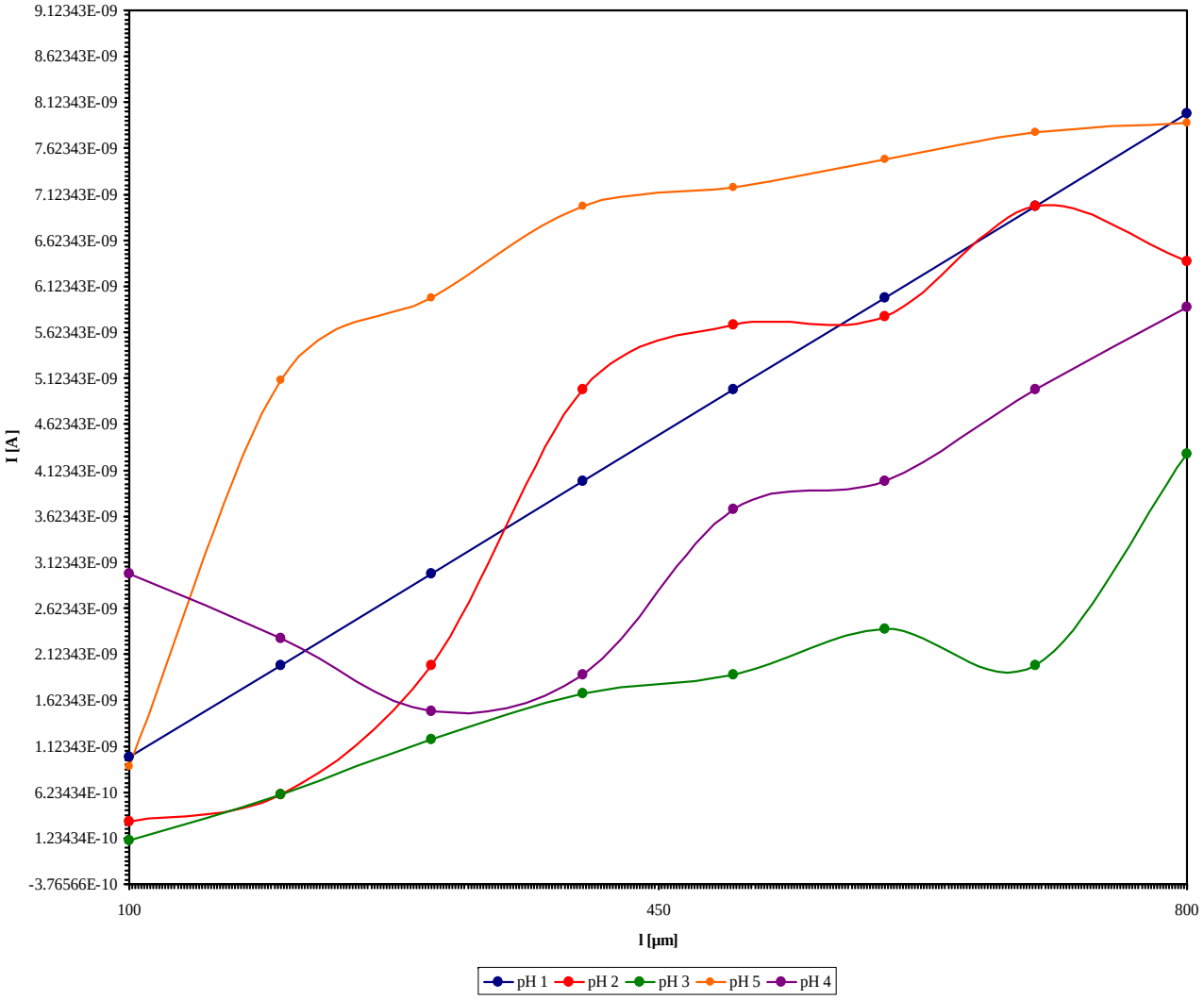


Thickness of Lines and Dots



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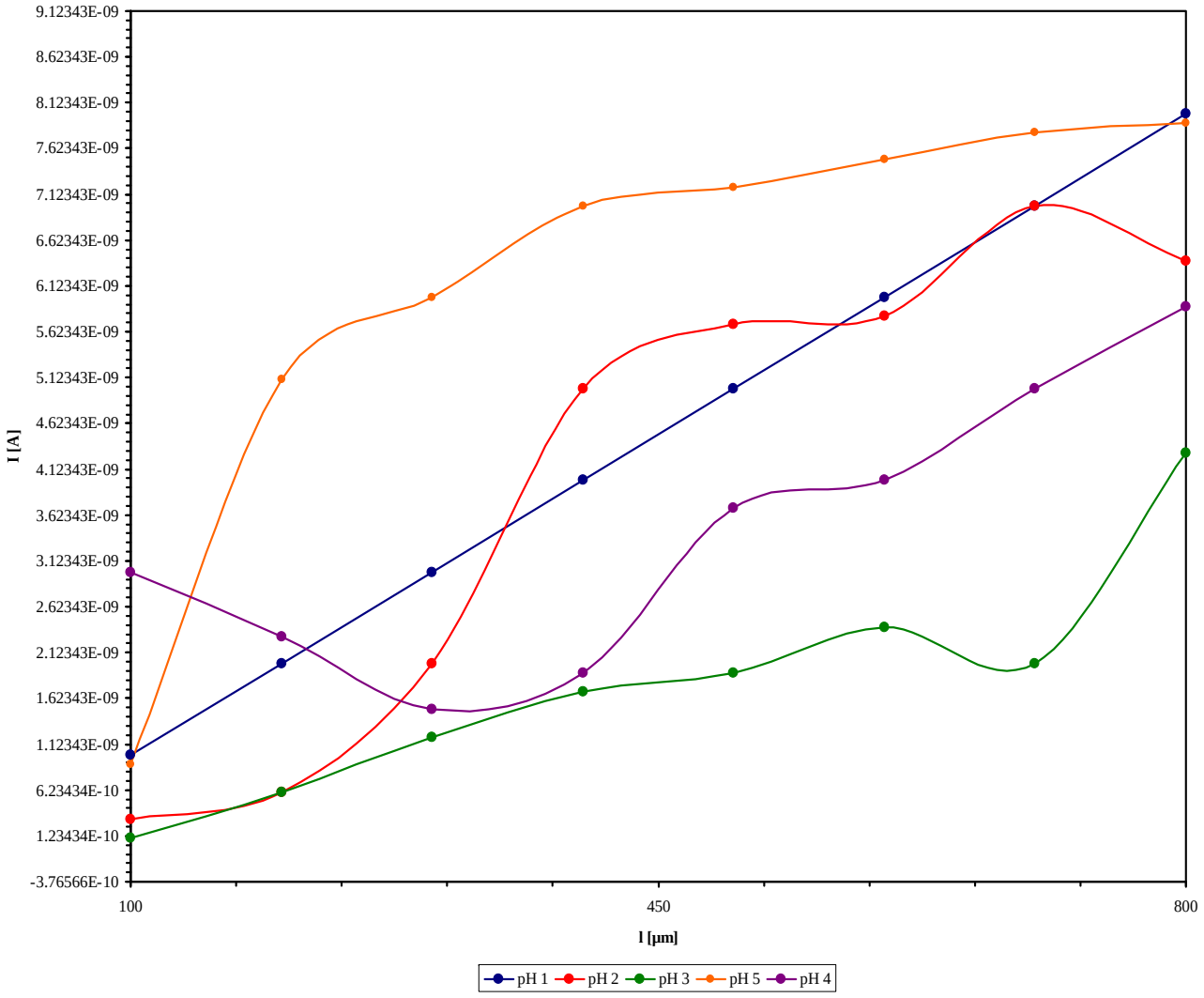
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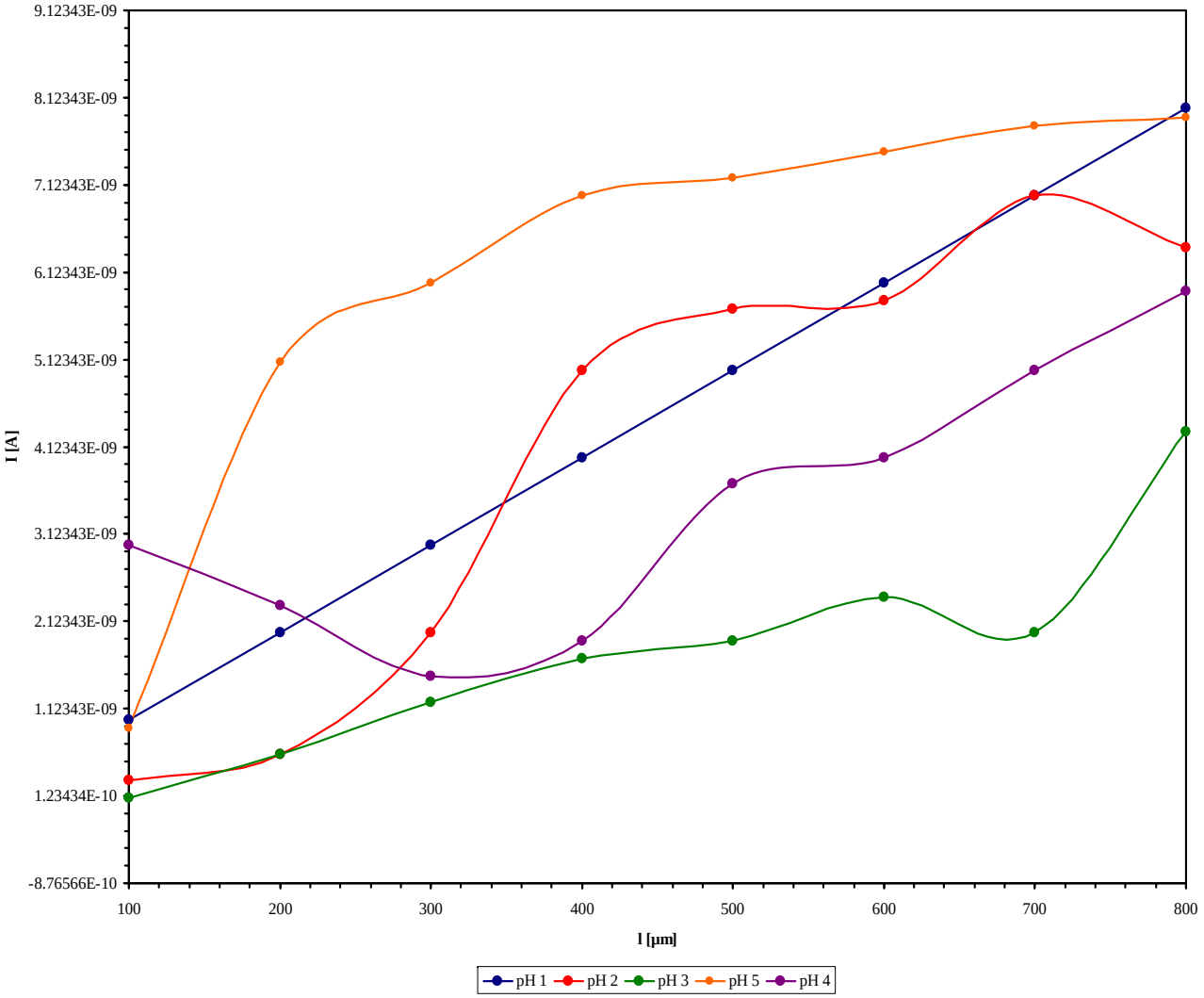
Scales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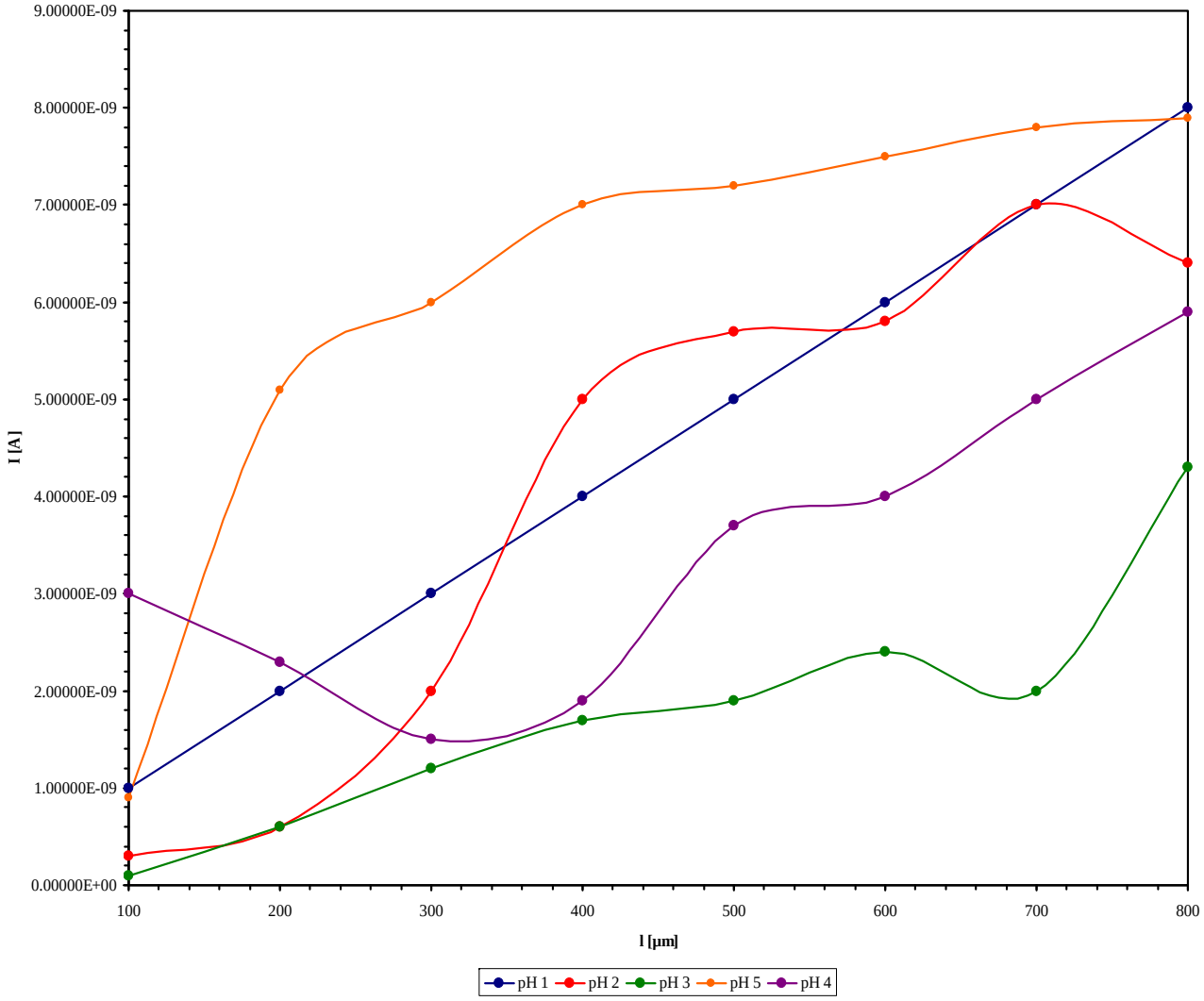
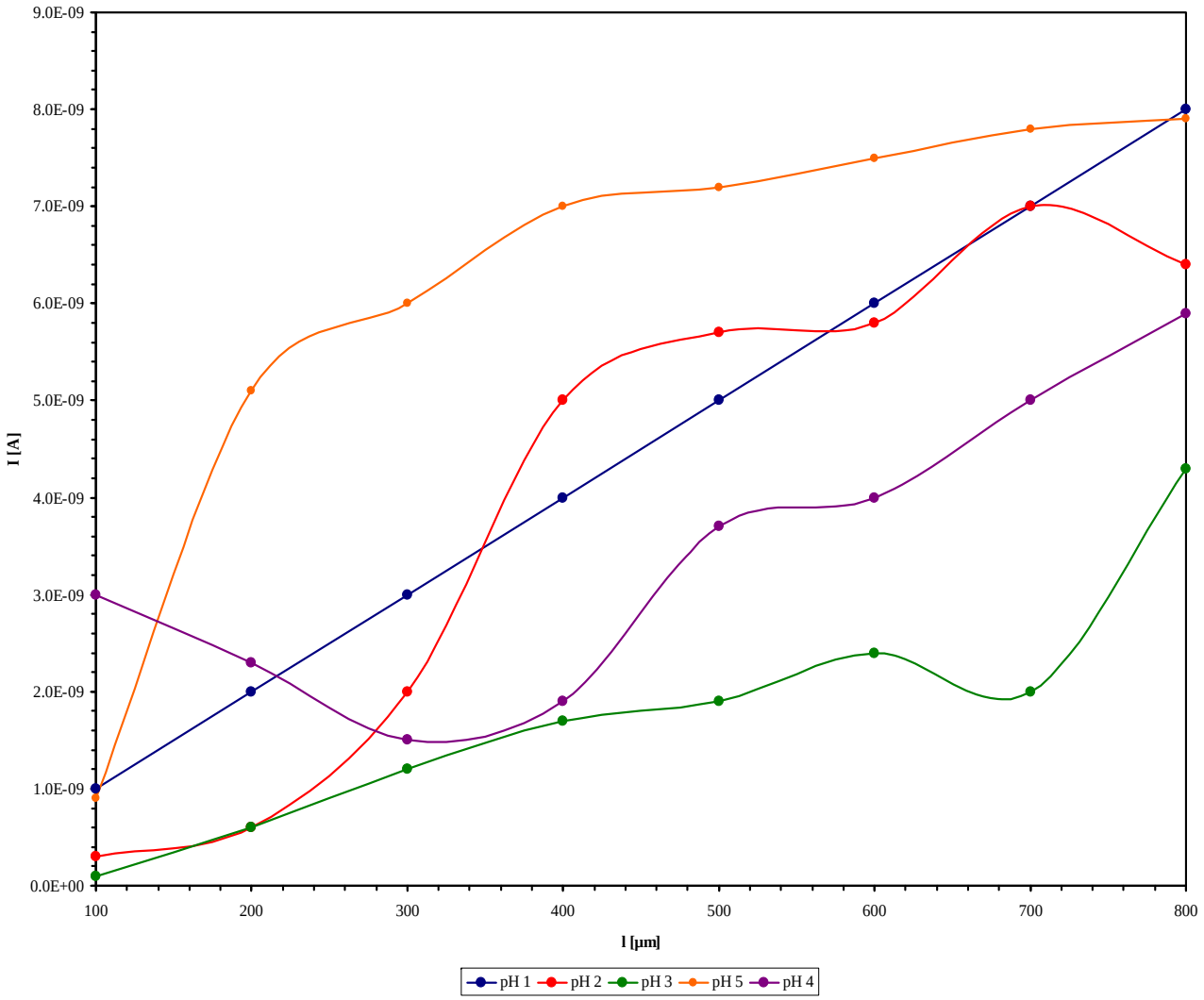
Numbers



Numbers (…continued)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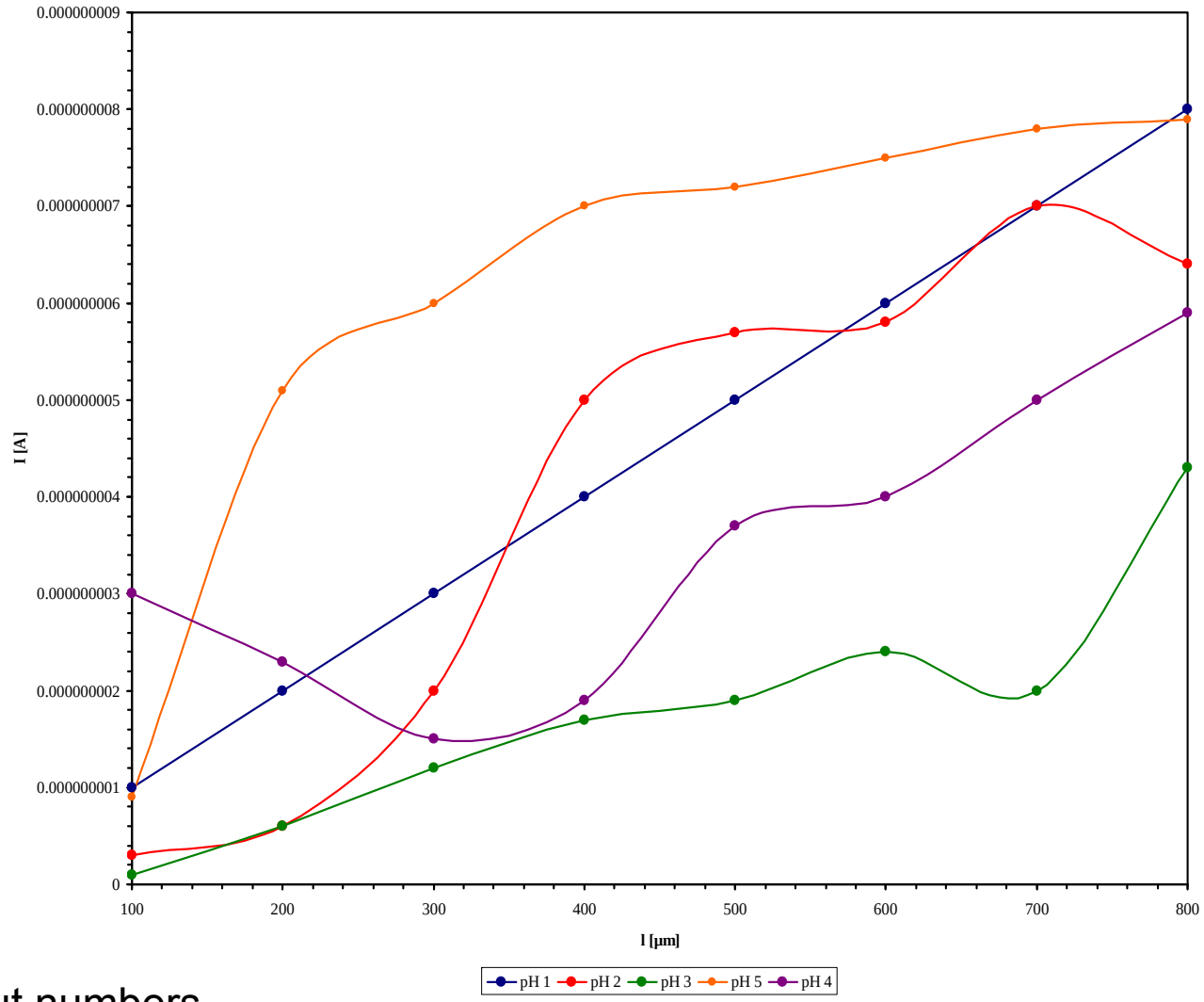
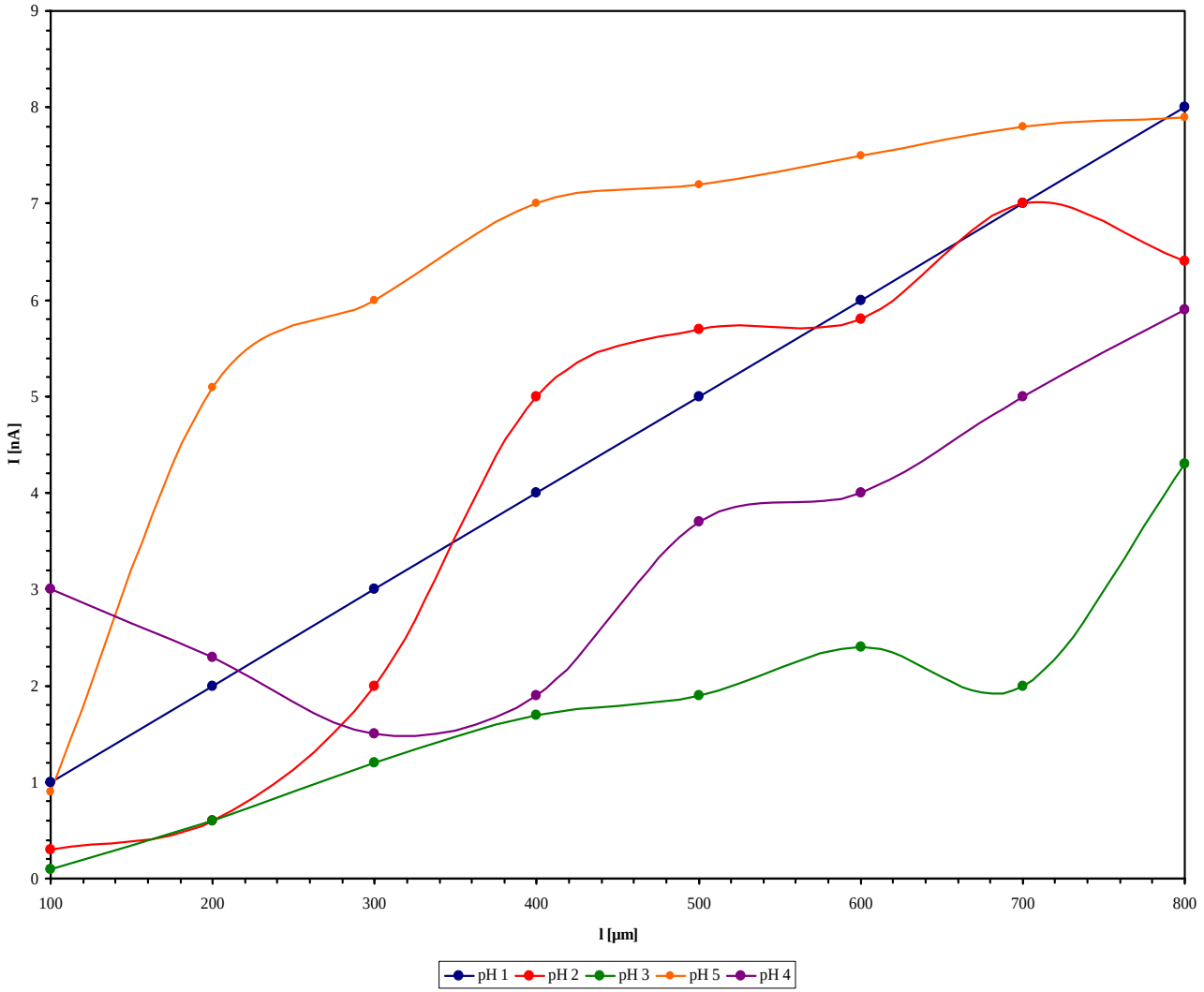
pH 3
pH 5
pH 4

Numbers…



… more about numbers…



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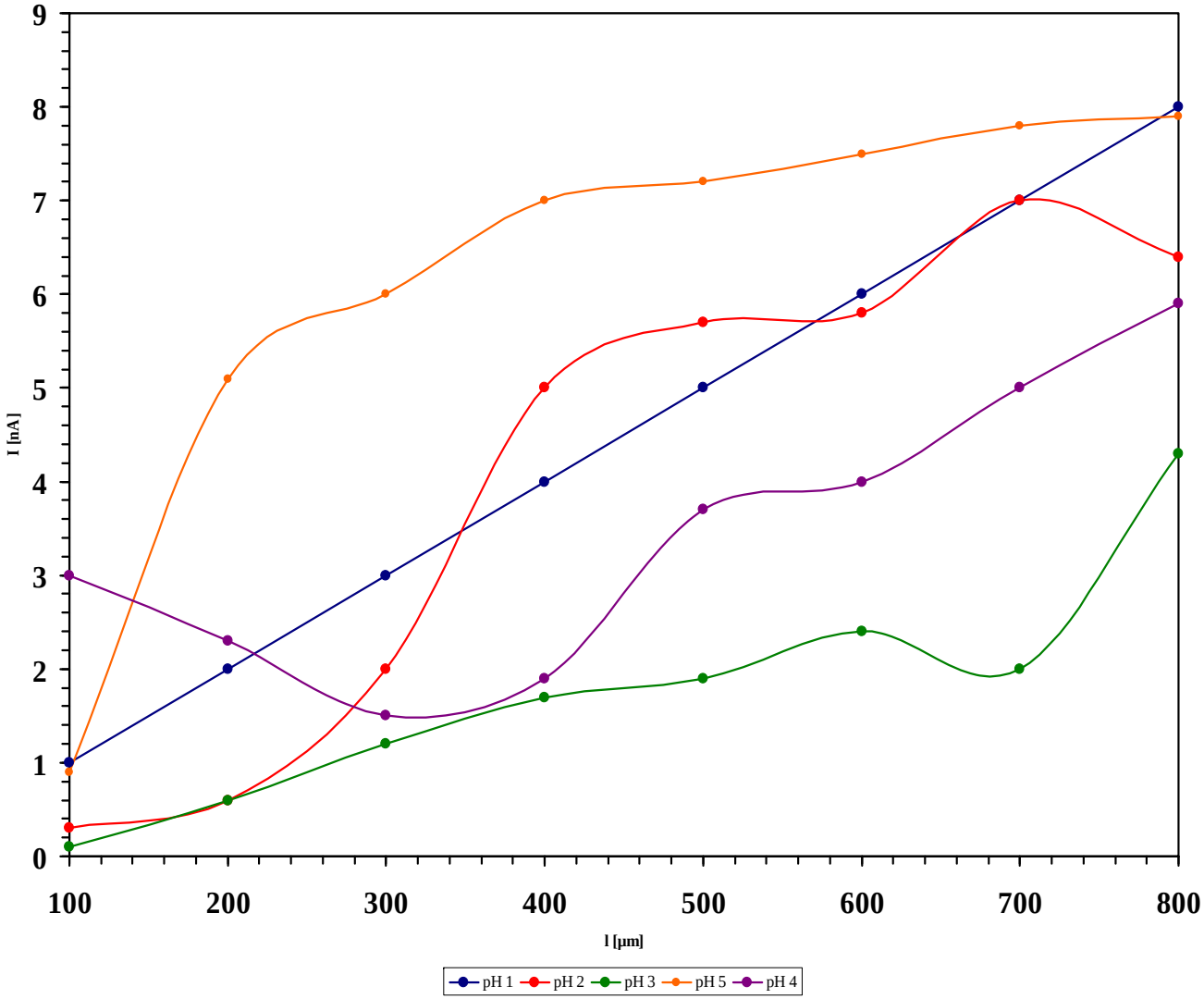

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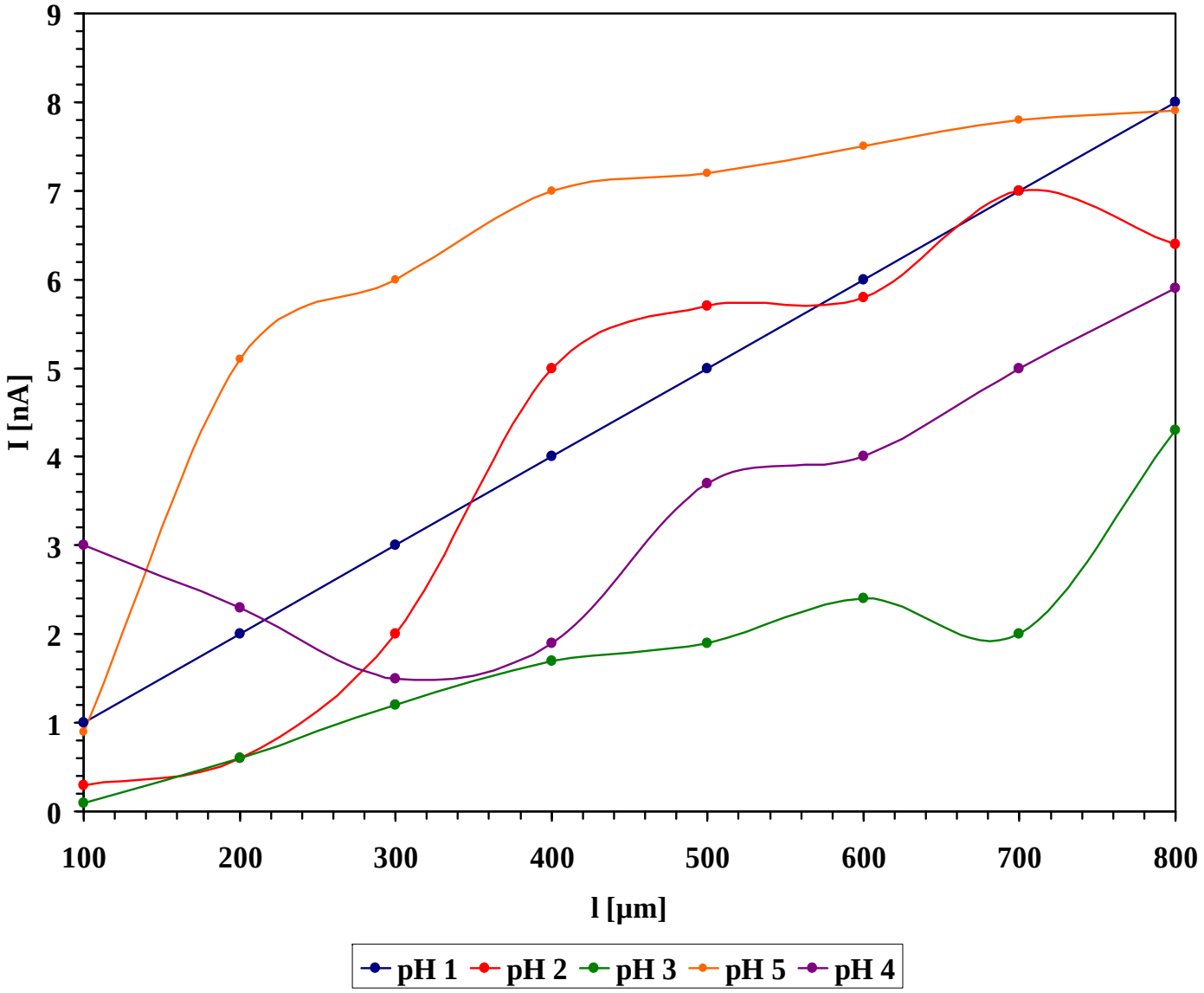
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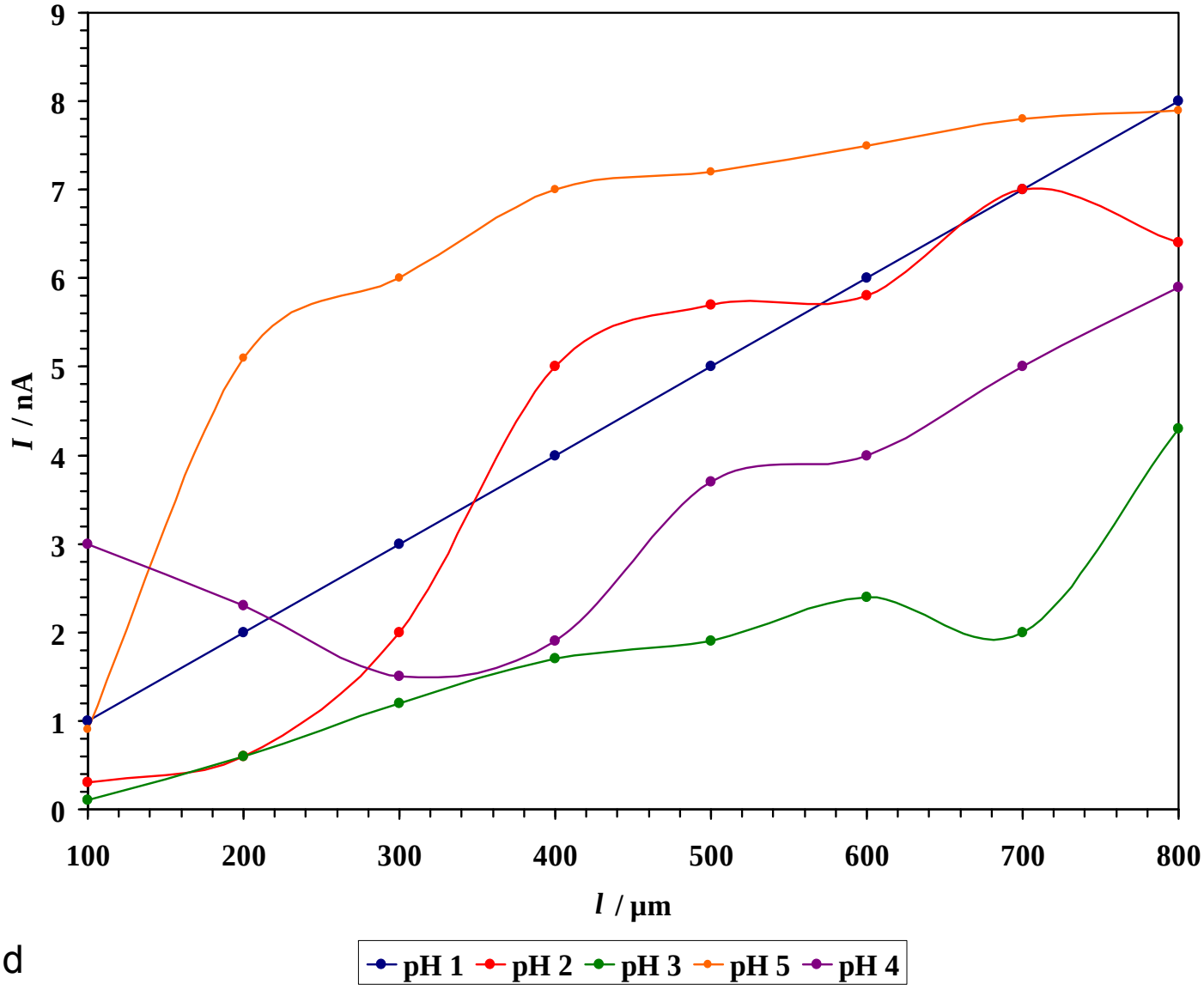
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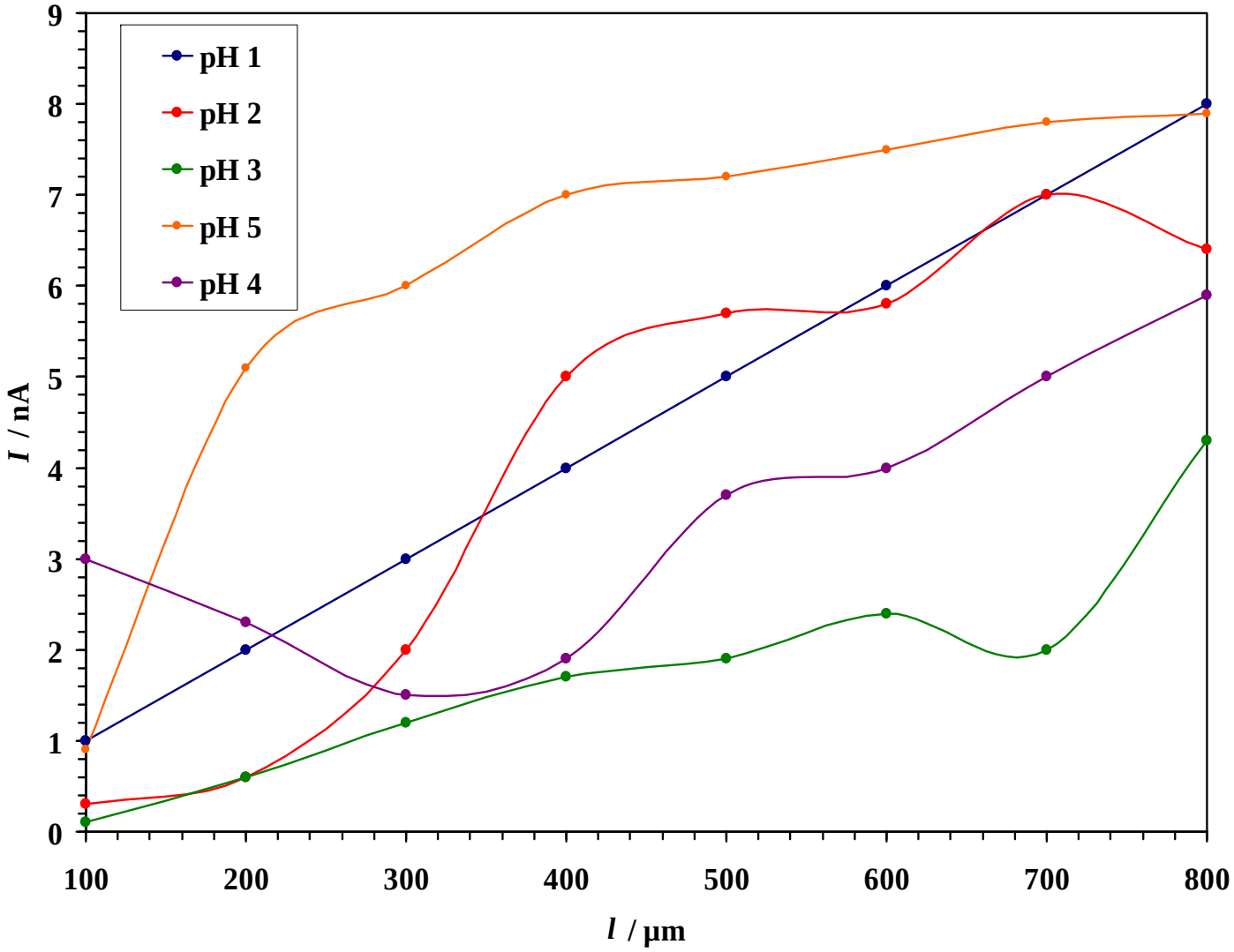
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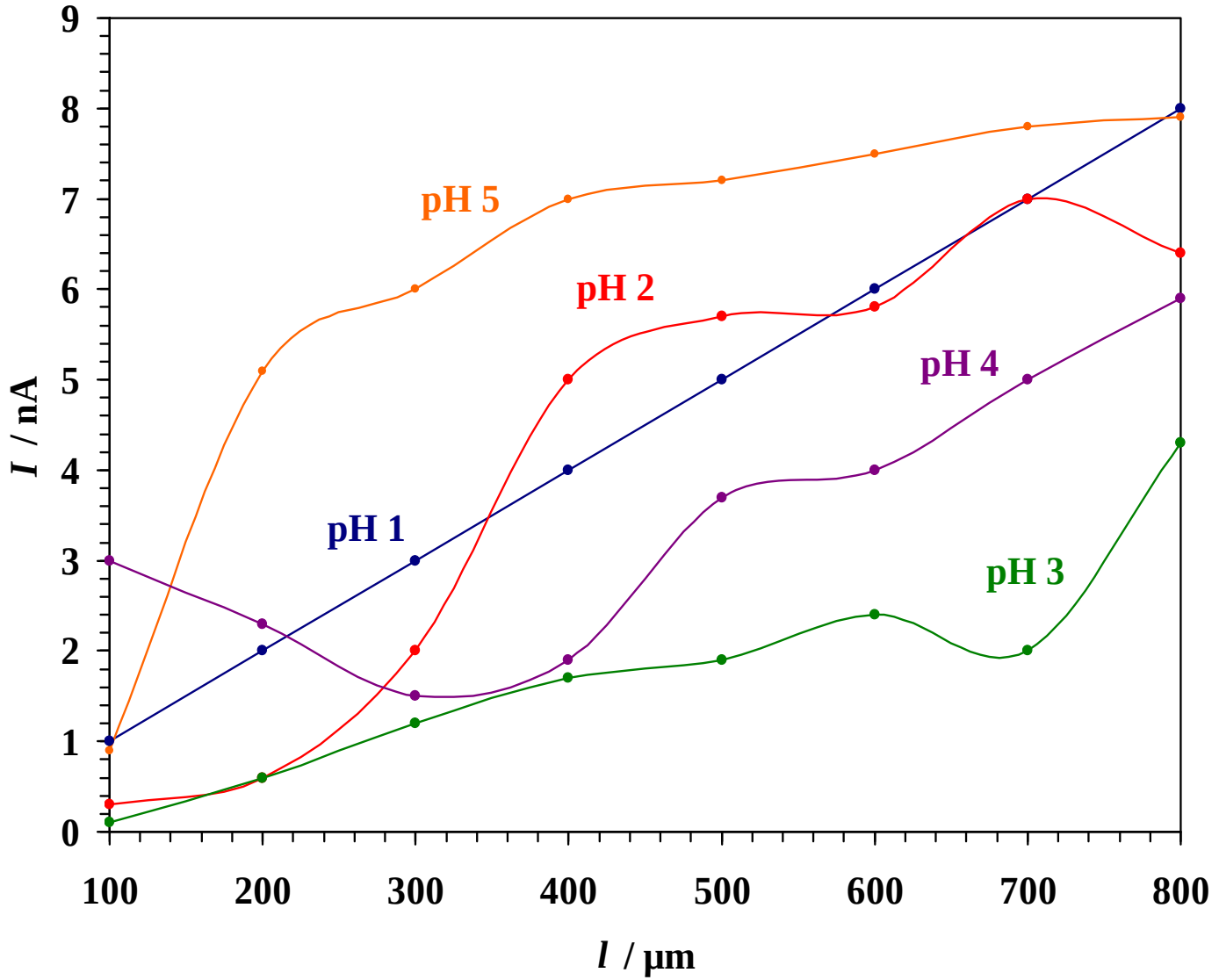
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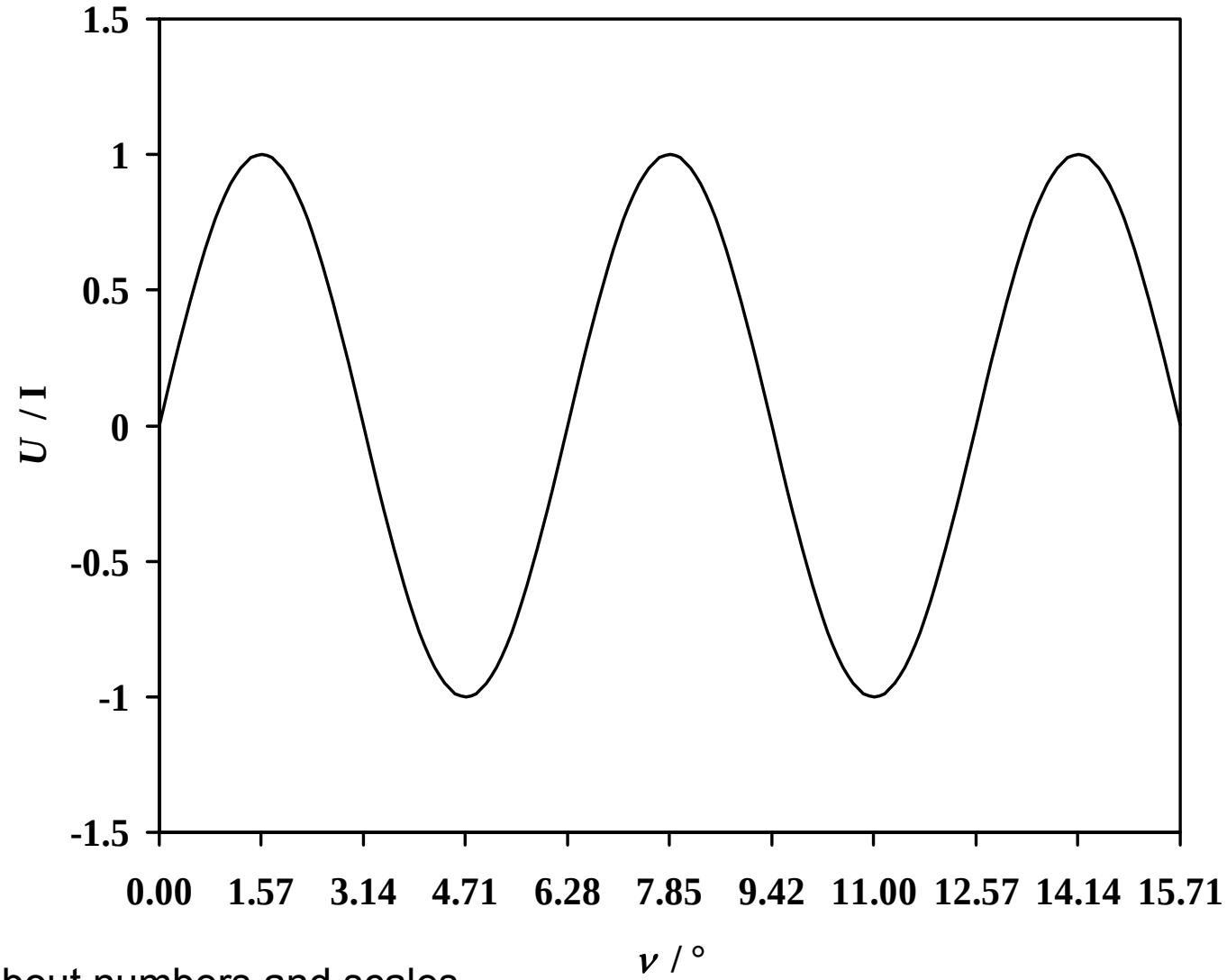
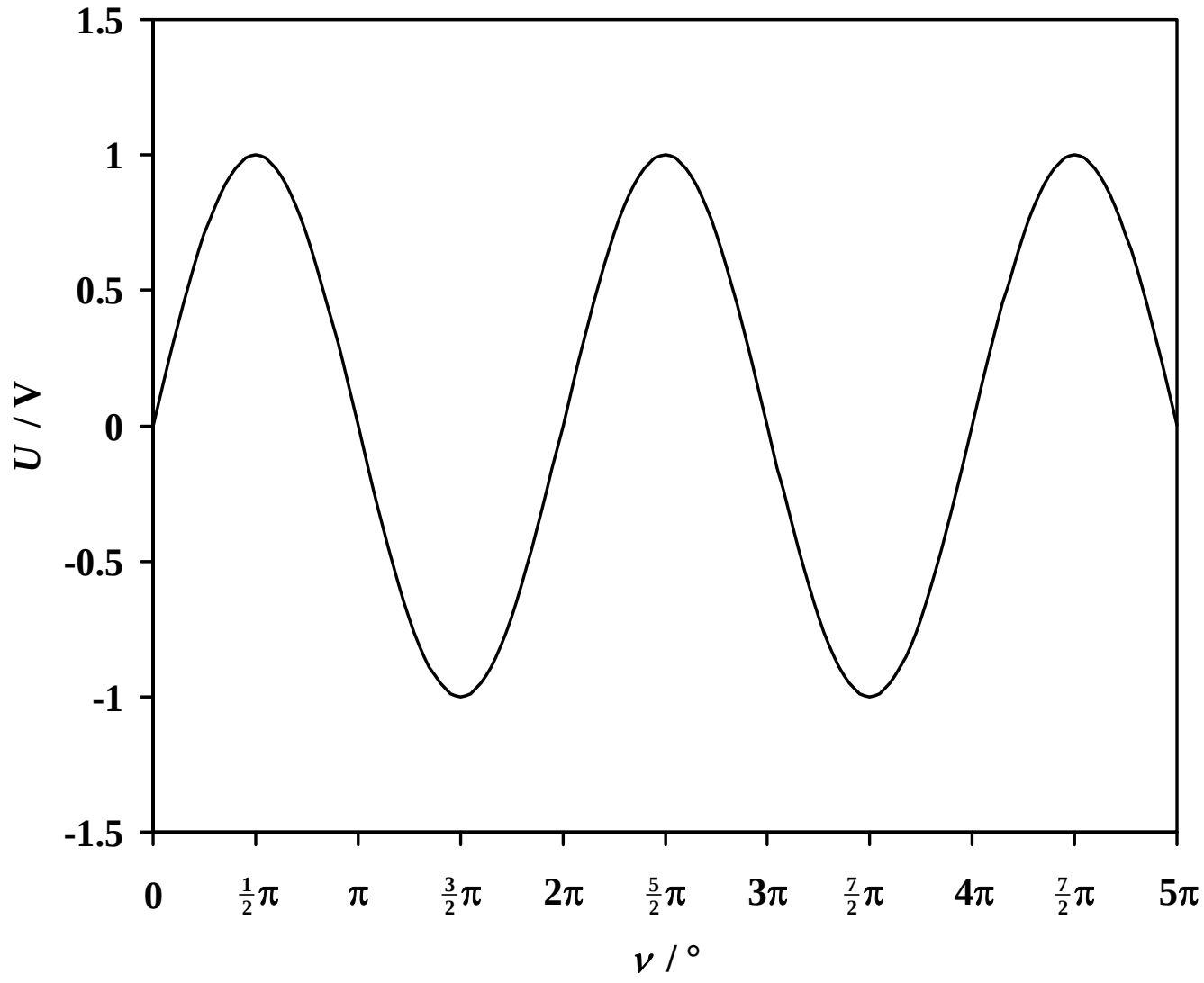
nice!



…more about numbers and scales



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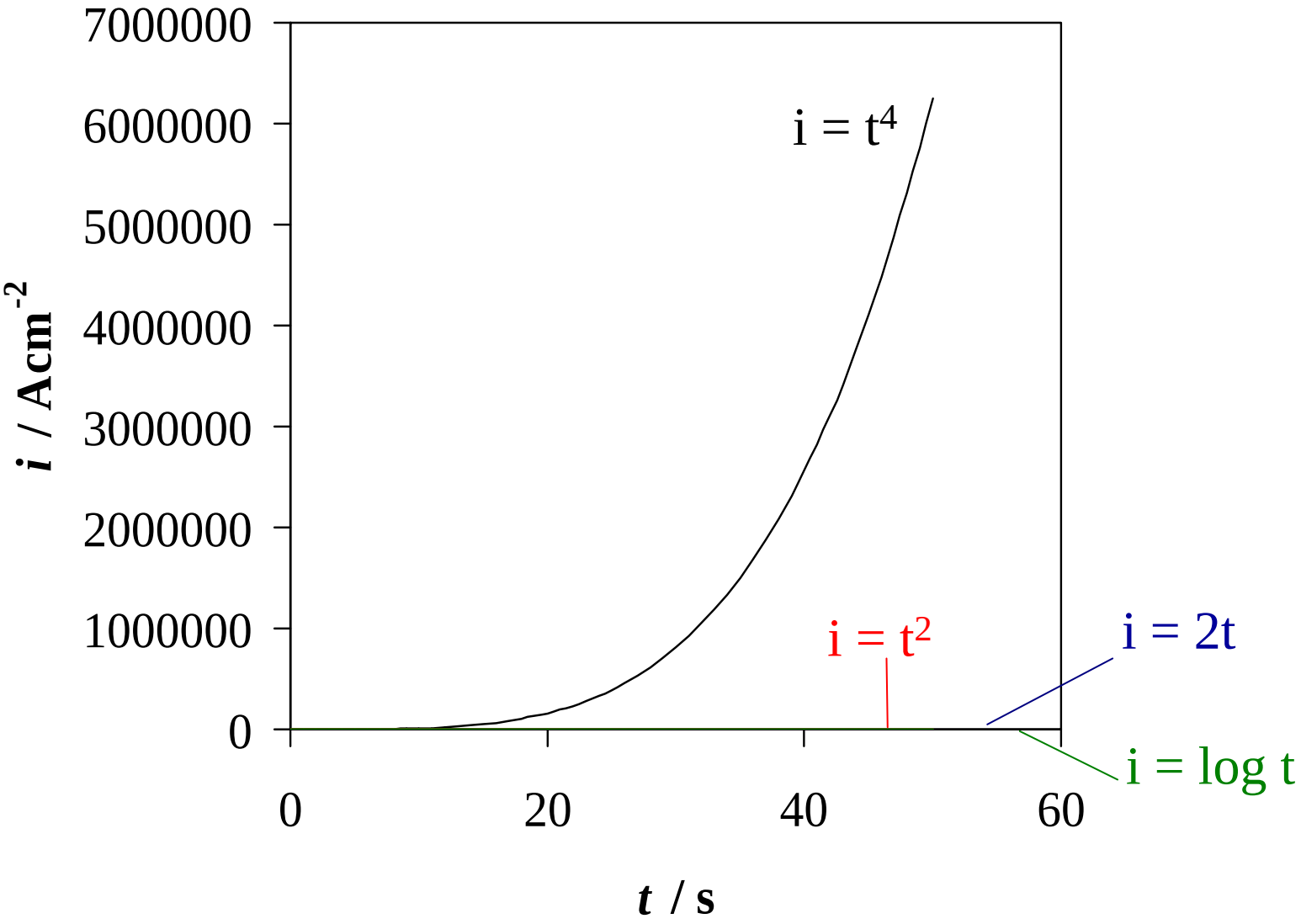
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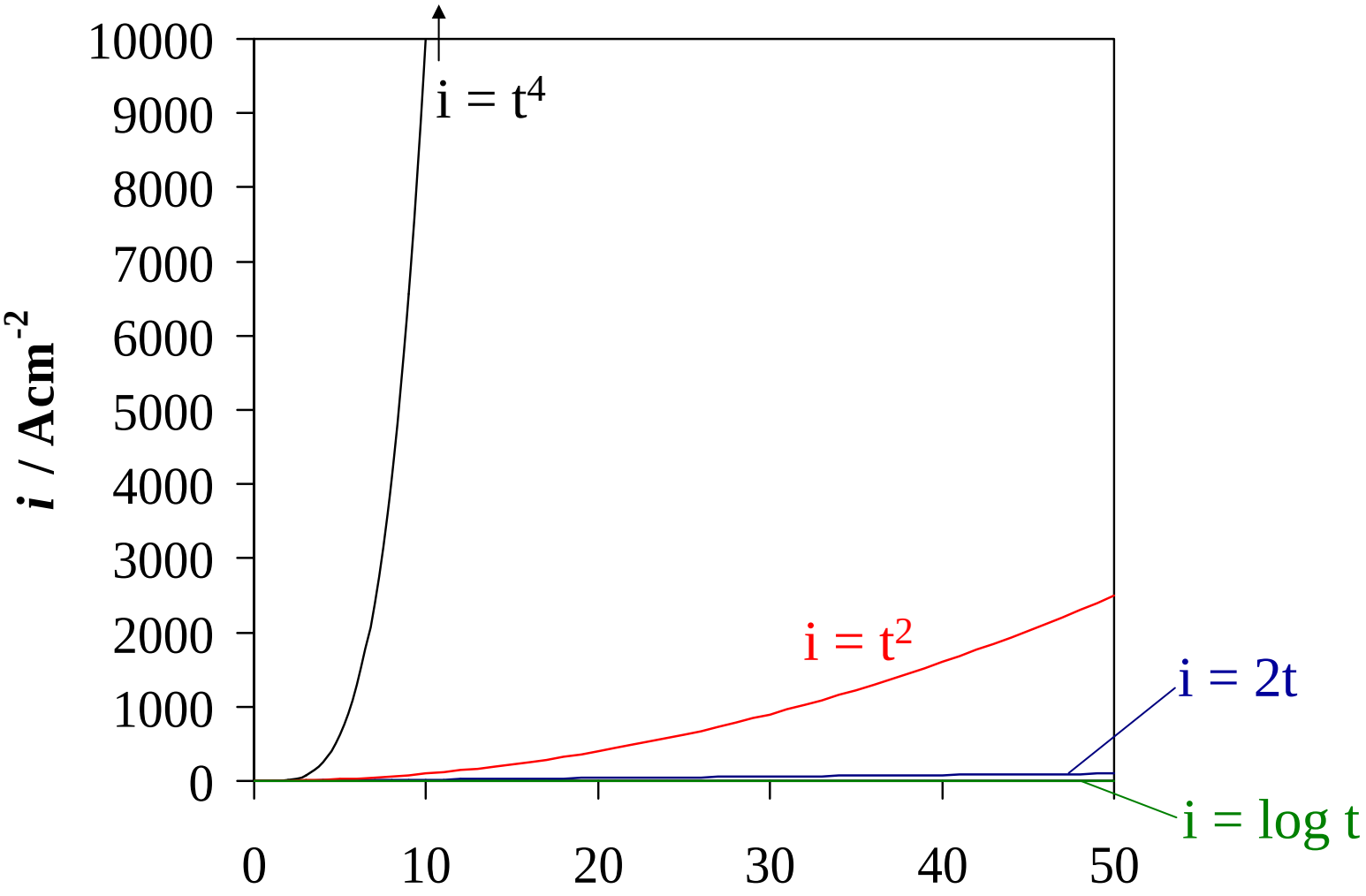
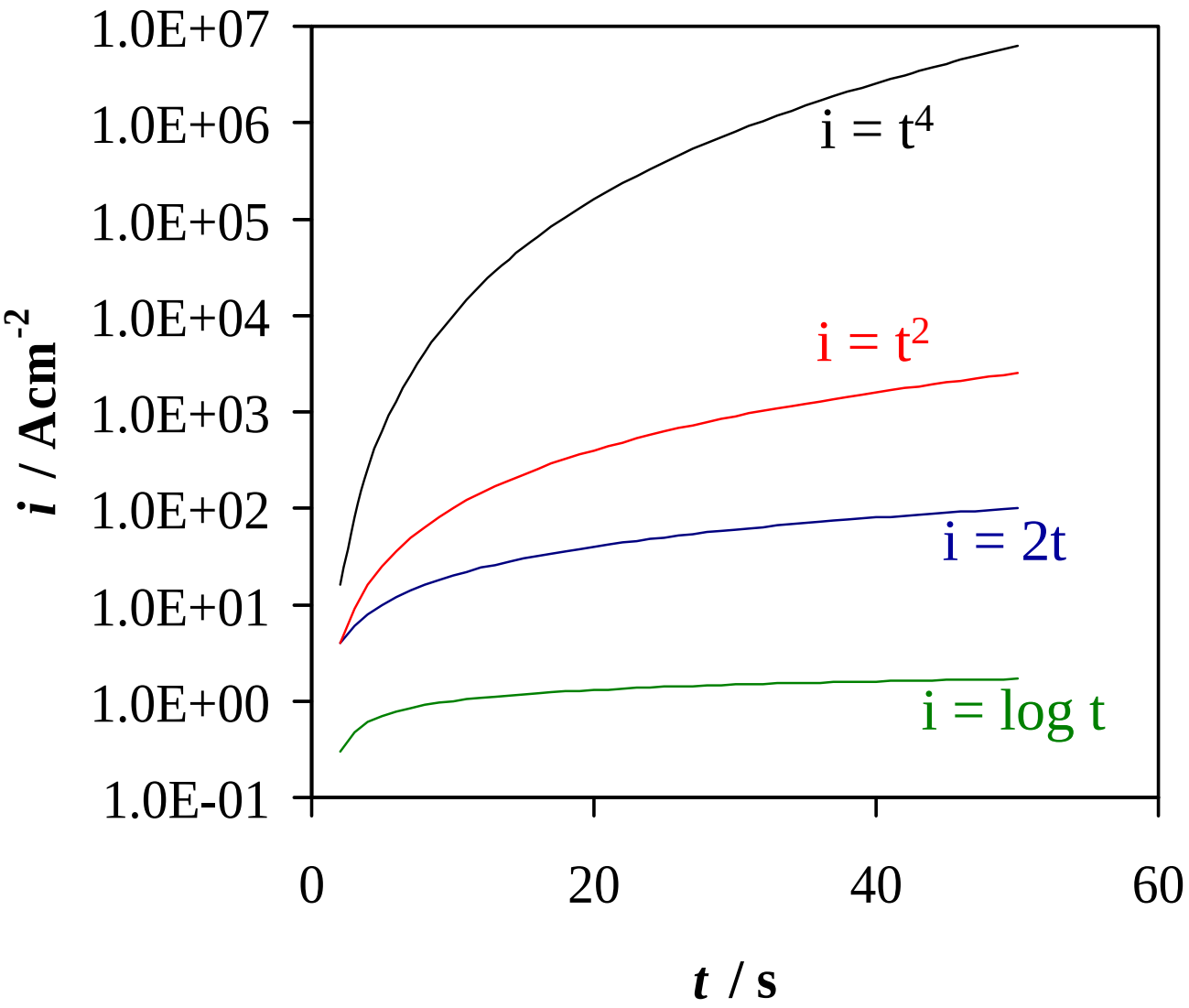
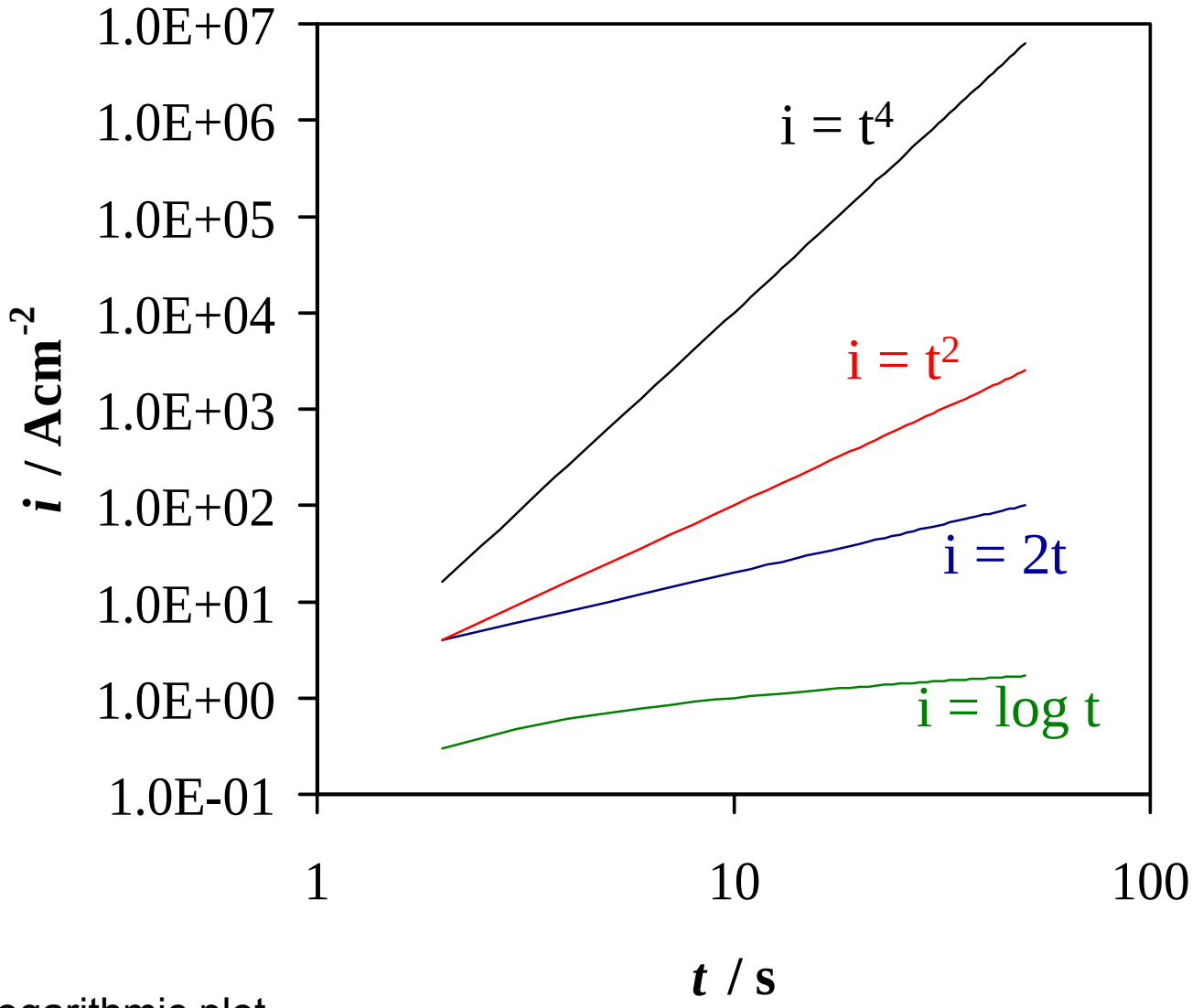


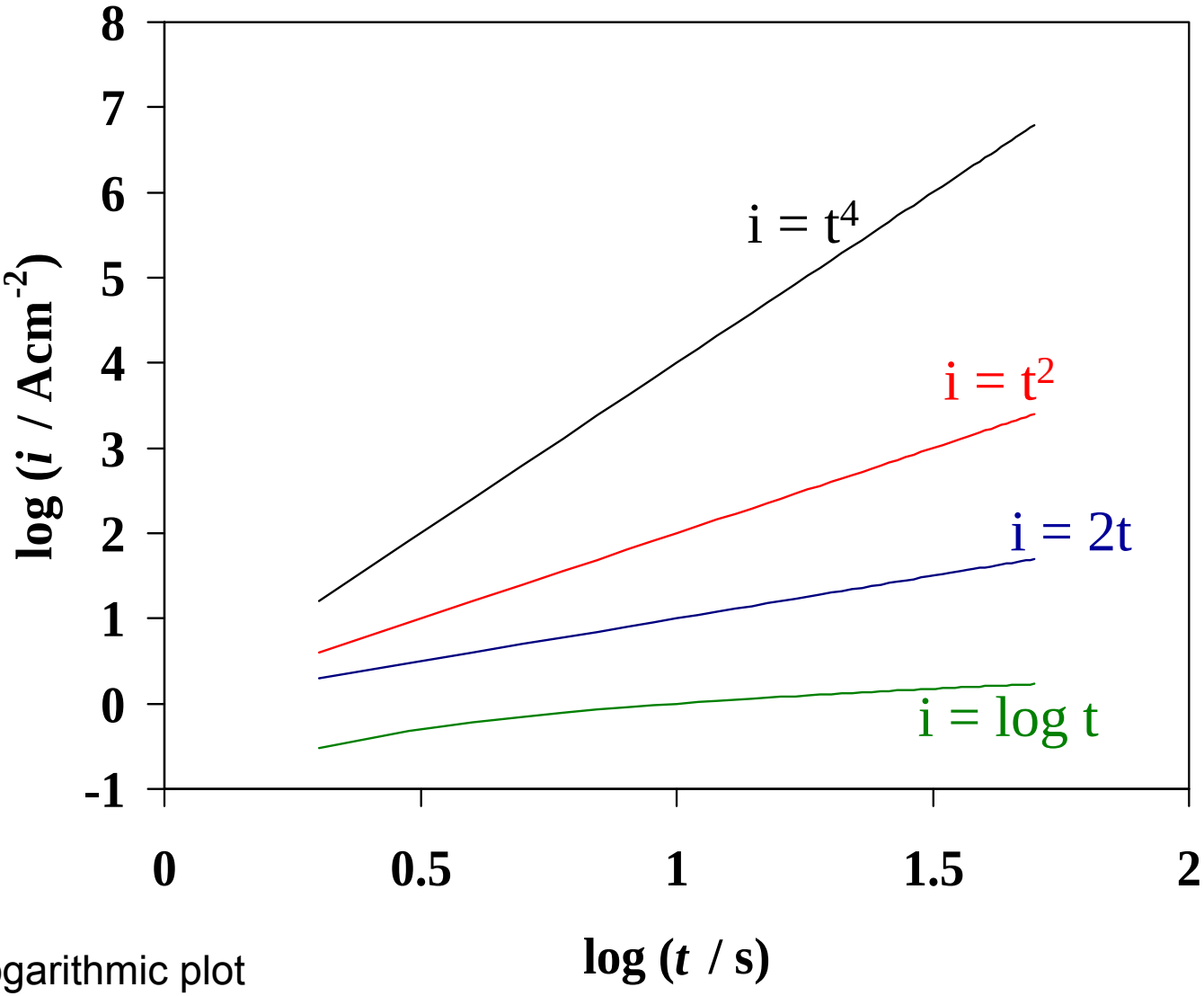
and more on scales…



logarithmic scale



double logarithmic plot



double logarithmic plot

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JOHANNES KEPLER
UNIVERSITÄT LINZ

Scientific paper / report

Protokoll der techn. Arbeit

Table of contents

Manuscript preparation guidelines for "Seminar of Chemical Technology of Inorganic Materials"

Given name Family name

Student registration number

The abstract should describe in maximum 100 words what the content of the paper is. The format of this seminar paper is similar to the format used for publishing a scientific article. As you may have already noticed, the template starts with a header. Modify in the header the semester and the year in which you attend this seminar (SS - summer semester, WS - winter semester), your name and a short name of your paper. The title should be written using Arial 18 pt, your name with Arial 10 pt **bold** and the Student registration number with Arial 10 pt. This Abstract is written using Times New Roman 9 pt.

1 Introduction (Arial 10pt bold)

1.1 Subchapter (if needed) (Times New Roman 10 pt bold) This part is written using Times New Roman 10 pt and it should describe the topic of your paper, including the state of the art in the field up to date. The entire paper should be formatted using justify alignment and with 1.5 spacing. The paper should not be longer than 15 pages! There is no minimum number of pages required, but the amount of information given should be detailed enough to present clearly the topic. You can use this template to write you paper.

The entire paper should be written using academic (impersonal) voice. Do not use "I believe…", "In my opinion…", "…you can see".

Here you should include some cited literature (the references). The references should be cited between brackets [] and they should appear in order. If the references are at the end of the sentence place them before the point [1]. If you want to cite more than one reference do it in the following way: [1-4] for references 1, 2, 3, 4 and [1, 6, 9] for references 1, 6 and 9. For a combination of both types, use: [1-4, 6, 9] for references 1, 2, 3, 4, 6, 9.

Details about how to format the references and what should be included can be seen at the end of this paper.

2 Main body, you chose the title as a function of your topic (Arial 10 pt bold)

2.1 Subchapter (if needed) In this section you should describe in detail your topic using the cited literature. In this part you should include also most of the Figures and Tables (if necessary to express better your research). The Figures and Tables should be numbered in order (Figure 1/Table 1, Figure 2/Table 2,…). Both Figures and Tables can be one column (8.4 cm) or two columns (17.2 cm) wide. The captions should be placed below the Figure and written using Times New Roman 9 pt. Only "Figure/Table" and the figure/table number should be written in **bold**. Both the caption for tables and figures should clearly and adequately describe the table or figure, respectively.

Axis labels are indicated as following: *physical dimension* / unit (e.g. T / K or σ / MPa). Units can be separated as following: MPa s^{-1} or Kg m/s^2. Numerical values and units are separated by spacing; mA and m A represent different units! Symbols and units must be used in a consistent manner in the entire paper. The number

format should not use comma, but the decimal point. It is preferably to use both in the text and the figures scientific notation as in 3.5×10^{-4} A, or 0.35 mA (no engineering notation like 3.5 E^{-4}). Units (e.g. A/cm, K, Ω) should be written in upright letters (not in italics). SI units should be used.

Table 1 Fonts and font sizes used for this paper.

Style	Font	Size
Title	Arial	18 pt
Author	Arial bold	10 pt
Student registration number	Arial	10 pt
Abstract	Times New Roman	9 pt
Main text	Times New Roman	10 pt
Heading	Arial bold	10 pt
Inline heading	Times New Roman bold	10 pt
Figure caption	Times New Roman	9 pt
Table title	Times New Roman	9 pt
Table body	Times New Roman	9 pt
Equations	Times New Roman	10 pt
References	Times New Roman	9 pt

In the Tables the font should be Times New Roman 9 pt. The text inside the Table should be aligned to the left, if necessary right (like in the last column from Table 1).

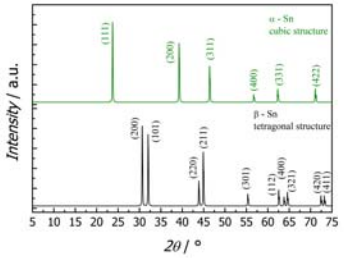

Figure 1 X-ray diffractograms of α-Sn and β-Sn polycrystalline sample showing the different crystal structures. The crystallite orientations are indicated by Miller indices [10]. If the Figure was taken from a reference, cite the reference in the caption.

If you need to make a graph, follow these rules. The font used is Times New Roman. The axis labels are 36 pt, and the numerical values on the axis are 28 pt. Apply for the axis the following conditions: Thickness: 2, Major and Minor ticks: IN.

Equations should be numbered sequentially and they should appear on a separate line centered:

$$E = mc^2 \qquad (1)$$

3 Discussion (Arial 10 pt bold)

In this section you should present your opinion about the topic, you should interpret the data and discuss it (but still using impersonal voice).

4 Conclusions (Arial 10 pt bold)

In this section you should make a short summary of the information presented in the paper and to draw some conclusions.

References (Arial 10 pt bold)

All authors should be cited. References that contain *et al* are not allowed. The scientific articles should be cited as:

[1] F. First author family name, S. Second author family name, and L. Last author family name, "Title of the article", *Journal full name* **Volume** (year) first page-last page

[2] A. W. Hassel, and D. Diesing, "Breakdown of ultrathin anodic valve metal oxide films in metal-insulator-metal-contacts compared with metal-insulator-electrolyte contacts", *Thin Solid Films* **414** (2002) 296-303

[3] F. First author name, S. Second author name, and L. Last author name, Title of the Book (Publisher, City, year), first page-last page

[4] F. First editor name, S. Second editor name, and L. Last editor name (eds.), Title of the Edited Book (Wiley-VCH, Berlin, 2000), first page-last page

[5] F. Contributor author name, Title of the Contribution, Followed by the Title of the Series of Books, Vol. 1 (Publisher, City, year), chap. 1

A part from my Introduction (written by myself, of course):

The electron is a subatomic particle carrying a negative electric charge. It has no known components or substructure. Therefore, the electron is generally believed to be an elementary particle.[2] An electron has a mass that is approximately 1/1836 that of the proton.[9] The intrinsic angular momentum (spin) of the electron is a half-integer value in units of ħ, which means that it is a fermion. The antiparticle of the electron is called the positron. The positron is identical to the electron except that it carries electrical and other charges of the opposite sign. When an electron collides with a positron, both particles may either scatter off each other or be totally annihilated, producing a pair (or more) of gamma ray photons. Electrons, which belong to the first generation of the lepton particle family,[10] participate in gravitational, electromagnetic and weak interactions.[11] Electrons, like all matter, have quantum mechanical properties of both particles and waves, so they can collide with other particles and be diffracted like light. However, this duality is best demonstrated in experiments with electrons, due to their tiny mass. Since an electron is a fermion, no two electrons can occupy the same quantum state, in accordance with the Pauli exclusion principle.[10]

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Please read:
A personal appeal from
Wikipedia founder Jimmy Wales

Electron

From Wikipedia, the free encyclopedia

For other uses, see Electron (disambiguation).

The **electron** is a subatomic particle carrying a negative electric charge. It has no known components or substructure. Therefore, the electron is generally believed to be an elementary particle.[2] An electron has a mass that is approximately 1/1836 that of the proton.[3] The intrinsic angular momentum (spin) of the electron is a half-integer value in units of $\hbar$, which means that it is a fermion. The antiparticle of the electron is called the positron. The positron is identical to the electron except that it carries electrical and other charges of the opposite sign. When an electron collides with a positron, both particles may either scatter off each other or be totally annihilated, producing a pair (or more) of gamma ray photons. Electrons, which belong to the first generation of the lepton particle family,[10] participate in gravitational, electromagnetic and weak interactions.[11] Electrons, like all matter, have quantum mechanical properties of both particles and waves, so they can collide with other particles and be diffracted like light. However, this duality is best demonstrated in experiments with electrons, due to their tiny mass. Since an electron is a fermion, no two electrons can occupy the same quantum state, in accordance with the Pauli exclusion principle.[10]

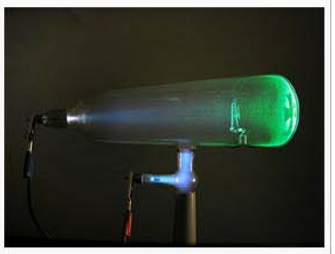
The concept of an indivisible amount of electric charge was theorized to explain the chemical properties of atoms, beginning in 1838 by British natural philosopher Richard Laming;[4] the name *electron* was introduced for this charge in 1894 by Irish physicist George Johnstone Stoney. The electron was identified as a particle in 1897 by J. J. Thomson and his team of British physicists.[5][12][13]

In many physical phenomena, such as electricity, magnetism, and thermal conductivity, electrons play an essential role. An electron in motion relative to an observer generates a magnetic field, and will be deflected by external magnetic fields. When an electron is accelerated, it can absorb or radiate energy in the form of photons. Electrons, together with atomic nuclei made of protons and neutrons, make up atoms. However, electrons contribute less than 0.06% to an atom's total mass. The attractive Coulomb force between an electron and a proton causes electrons to be bound into atoms. The exchange or sharing of the electrons between two or more atoms is the main cause of chemical bonding.[14]

According to theory, most electrons in the universe were created in the big bang, but they may also be created through beta decay of radioactive isotopes and in high-energy collisions, for instance when cosmic rays enter the atmosphere. Electrons may be destroyed through annihilation with positrons, and may be absorbed during nucleosynthesis in stars. Laboratory instruments are capable of containing and observing individual electrons as well as electron plasma, whereas dedicated telescopes can detect electron plasma in outer space. Electrons have many applications, including welding, cathode ray tubes, electron microscopes, radiation therapy, lasers and particle accelerators.

Contents [hide]

Electron



Experiments with a Crookes tube first demonstrated the particle nature of electrons. In this illustration, the profile of the cross-shaped target is projected against the tube face at right by a beam of electrons.[1]

Composition:	Elementary particle[2]
Particle statistics:	Fermionic
Group:	Lepton
Generation:	First
Interaction:	Gravity, Electromagnetic, Weak
Symbol(s):	e^-, β^-

Done

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Please, be aware:

- We are always collecting all the old Protokolls

  Wir bewahren alle alten Protokolle auf

- We can use the Internet as easy as you do

  Wir können ebenfalls mit dem Internet umgehen

- We will get the same search results on Google as you do

  Wir erhalten die gleichen Google-Suchergebnisse

- Have you ever heard about anti-Plagiarism software? We have!

  Kennen Sie Anti-Plagiat-Software? Wir schon!

Plagiarism will not be tolerated!

Abschreiben wird nicht toleriert!

Personal evaluation

Bewertung

Grades: min 0%, max 100%

Weight for the final grade

Gewichtung bzgl. der Gesamtnote

- Personal interviews during entire Praktikum

  - be prepared before starting an experiment

  - 2 times oral examination or TA proposal failure = total failure

  Persönliche Gespräche während des Praktikums

  - Various theoretical aspects - Verschiedene theoretische Aspekte — 10 + 15 = 25 %

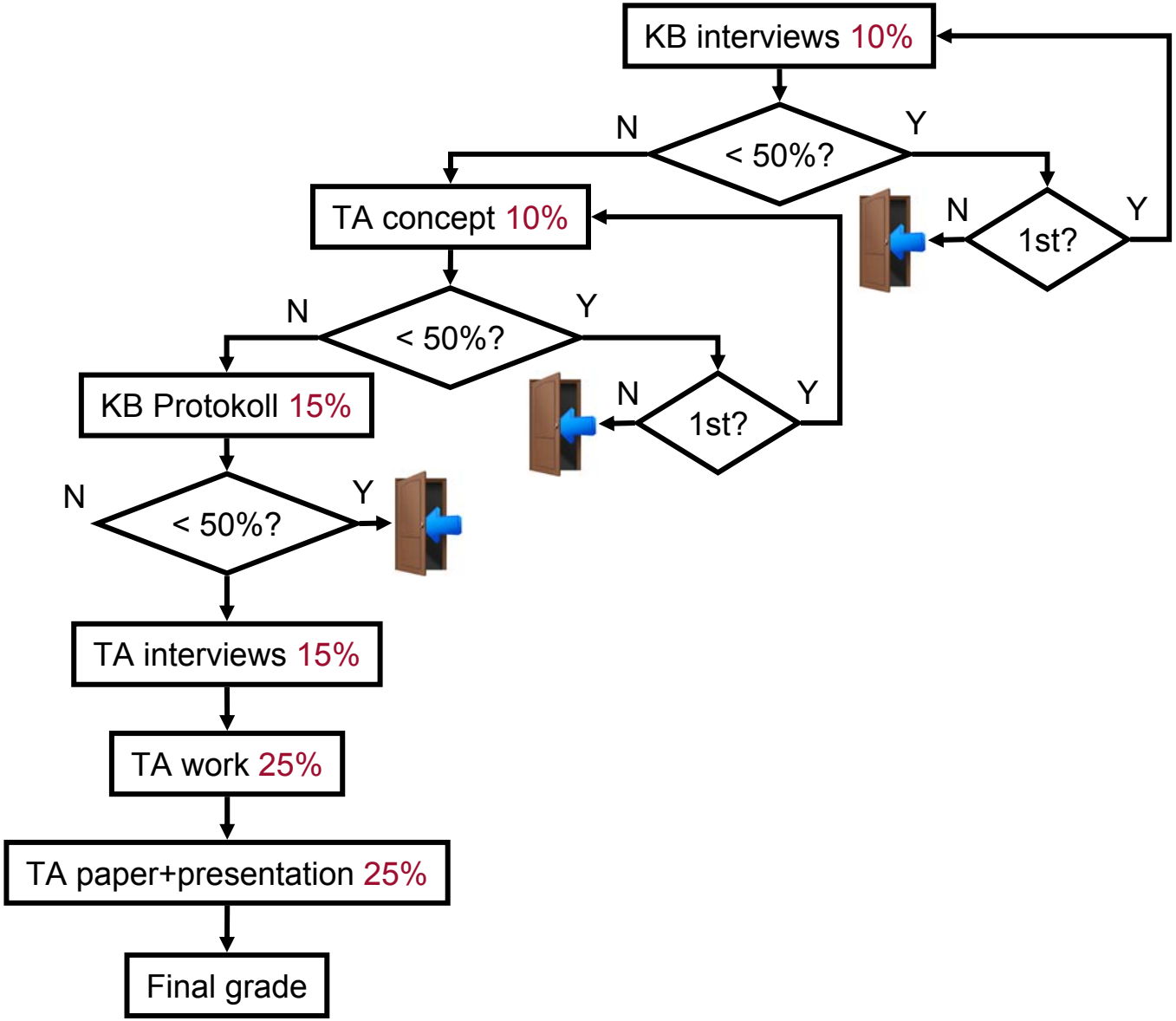
- Kurzbeispiele Protokoll

  - Scientific content - Wissenschaftlicher Inhalt — 15 %

- Technologische Arbeiten

  - Working concept - Konzept — 10 %
  - Work output - Arbeitsweise & -ergebnisse — 25 %
  - Scientific paper – Presentation — 25 %

  Protokoll der techn. Arbeit –Präsentation


KB interviews 10%
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< 50%?
Y
TA concept 10%
N
1st?
Y
N
< 50%?
Y
KB Protokoll 15%
N
1st?
Y
N
< 50%?
Y
TA interviews 15%
TA work 25%
TA paper+presentation 25%
Final grade

Percentage	Grade
<= 50	5
50.01 – 62.5	4
62.51 – 75	3
75.01 – 87.5	2
87.51 – 100	1

A minimum of 50.01% is required at every activity!

Plagiarism – Plagiate = 0%

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Safety regulations

Sicherheitsbestimmungen

Mechanical Workshop – General recommendations

Werkstatt – Allgemeine Hinweise

- Always use protective glasses – Die Schutzbrille ist stets zu tragen

- Wear your lab coat for protecting your clothes – Einen Labormantel tragen

- Avoid using sandals or shoes which exposes the leg

  Nur geschlossene Schuhe tragen

- Try to have your body covered as much as possible

  Körperbedeckende Kleidung tragen

- If you have long hair, have it always bound together

  Langes Haar zusammenbinden

Drilling machine - Bohrmaschine

- Use the machine only for its designed purpose

  Die Bohrmaschine nur für den vorbestimmten Zweck benutzen

- Fix the drill properly, use lubrication and do not apply too much pressure in order to avoid breaking the drill – a broken drill can kill

  Den Bohrer ordnungsgemäß befestigen, Schneidöl benutzen und keinesfalls zu viel Druck ausüben

- Never use gloves while drilling

  Beim Bohren niemals Handschuhe tragen

- Always use the dedicated holder

  Zum Bohren immer den Halter benutzen

- Have respect for the machine – exaggerated self-confidence leads to tragedies

  Den Respekt vor der Maschine behalten

Cutting/polishing tools – Saw, File - Säge, Schleiffeile

- Fix your sample properly

  Probe immer befestigen

- Always pay attention what the saw is cutting

  Während des Sägens immer die Säge im Auge behalten

- Manual saw/file – remember that the saw/file cuts when you push

  Manuelle Säge/Schleiffeile – Das Werkzeug schneidet bzw. schleift durch Drücken

- Always help your colleague if she/he cannot do the task – don't ignore the situation

  Bei Schwierigkeiten den KollegInnen helfen – die Situation nicht ignorieren

- Always show your colleague when she/he is using the tools inappropriate

  KollegInnen auf unsachgemäßen Gebrauch von Werkzeugen aufmerksam machen

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Thank you!

Danke!

Technologische Arbeiten

2. Investigation of metal codeposition using CV

- Investigation of electrolyte solutions containing one and/or more metal salt using cyclic voltammetry
- Investigation of the influence of additives
- Examination of suitable conditions for alloy electrodeposition
- **TEC recommended!**

Untersuchung der Co-Abscheidung von Metallen mittels CV

- Verschiedene Elektrolyte mit einem und / oder mehreren gelösten Metallsalzen sollen mittels Cyclovoltammetrie untersucht werden
- Untersuchung des Einflusses von Additiven
- Untersuchung geeigneter Bedingungen für Legierungsabscheidung

Technologische Arbeiten

3. Deposition of ITO by CVD

- Literature research
- Furnace temperature range, gas selection
- Analytical methods

Abscheidung von ITO - CVD

- Literatursuche
- Temperatur, Gas
- Analytische Methoden

Technologische Arbeiten

7. Chemical synthesis of $ZnMoO_4$

- literature research
- powder synthesis
- powder characterization (XRD and SEM)

Chemische Synthese von $ZnMoO_4$ Pulvern

- Literatursuche
- Synthese
- Pulver Charakterisierung (XRD und SEM)