How to Typeset Professional-Looking Manuscripts and Presentations

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Typesetting is the composition of text by means of arranging letters and symbols.

Learning how to typeset is important for communicating your science precisely, consistently, and correctly. Just like the proper use of grammar.

Would you submit a paper without capitalizing the first word of each sentence?
Would you submit a paper without using punctuation (e.g. periods and commas)?
Consistency is Key

Be mindful of consistency in:

- Typeface (e.g. Arial vs. Times New Roman)
- Font (size, italics, bolding)
- Symbols
- Spacing
- Units
- Justification
- ...

What should be consistent?

- Paragraphs with other paragraphs
- Titles with other titles
- Figure captions with other figure captions
- Placement of in-text citations
- All references within the bibliography
- ...

[Image 3x4 to 168x18]
[7x511]
Variables, Subscripts, and Superscripts

- All variables (scalars) and universal constants are *italicized*
  
  Temperature: $T$
  Fitting parameter: $n$
  Dispersity: $D$
  Boltzmann’s constant: $k$

- Vectors are **bold** and non-italicized
  
  Scattering wave vector: $\mathbf{q}$ (c.f. magnitude of the scattering wave vector $q$)
  Unit cell basis: $\mathbf{a}$, $\mathbf{b}$, and $\mathbf{c}$ (c.f. unit cell parameters $a$, $b$, and $c$)

- Superscripts and subscripts that represent labels or numbers are NOT italicized
  
  Number average molar mass: $M_n$
  Probability of selecting particle 1: $p_1$
  Avogadro’s number: $N_{\text{Av}}$
  Ten to the power of two: $10^2$

- Superscripts and subscripts that are themselves variables without a fixed value are *italicized*
  
  Molar mass of fraction $i$: $M_i$ for all $i = 1, 2, \ldots, n$
Symbols, whenever possible, should be typeset in the same typeface as the surrounding text (i.e. not ‘math mode’)

Example:

Good: ‘Common mathematical symbols used in manuscripts are $\alpha$, $\beta$, and $\gamma$.’

Bad: ‘Common mathematical symbols used in manuscripts are $\alpha$, $\beta$, and $\gamma$.’

Same typeface as the surrounding text

Different typeface from the surrounding text

Arial vs. Cambria Math (math mode)
Other Common Symbols

- Degree signs are symbols, not superscript ‘oh’ or ‘zero’
  
  20 °C/min  20 °C/min  20 °C/min

  Correct  Incorrect  Incorrect

- “Prime” and “double prime” are symbols, not apostrophes or quotation marks
  
  $G'$, $G''$  $G'$, $G''$, $G'''$

  Correct  Incorrect

- Ellipsis … is a symbol, not three periods … (notice the different spacing)

Can copy/paste all of these into Word/Powerpoint
Double check the font!
- Much-greater-than $\gg$ and much-less-than $\ll$ signs are symbols, not two greater-than or less-than symbols — c.f. $\gg$ and $\ll$

- Angle brackets, e.g. families of directions $\langle 123 \rangle$, are symbols, not greater than and less than signs — c.f. $\langle 123 \rangle$

- Times $\times$ is a symbol, not the letter ‘x’
Dashes

Hyphen (shortest): -

Usage:

- Compound nouns
- Compound adjectives

Examples:

Mother-in-law
Solid-forming reaction

‘en dash’ (medium): –

Usage:

- Minus signs
- Ranges of numbers
- Multiple names

Examples:

The temperature is –10 °C.
A broad 1H NMR resonance in the range 3–4 ppm.
Flory–Fox equation

‘em dash’ (longest): —

Usage:

- Parentheticals in middle of sentence
- Dash that separates two parts of a sentence

Examples:

The brown fox — a type of animal commonly found in the forest — jumped over a rock.
The hyphen is on your keyboard!

Can copy/paste all of these into Word/Powerpoint
Double check the font!
Units and Non-Breaking Spaces

Always place a non-breaking space between a number and its units: 25 K, 32 min, 800 sec

What is a non-breaking space?

Normal space

ctrl + shift + space on your keyboard
Paragraph Formatting — Maintain Consistent Spacing and Justification

Significance Statement
Lithium is a key ingredient in batteries, which are integral components of next-generation automobiles, airplanes, grid energy storage, and electronic devices. Unfortunately, lithium extraction from natural sources is laborious, slow, and costly, which motivates the search for more efficient isolation techniques. While polymeric membranes could, in principle, reduce the economic cost of lithium recovery, current membrane technology lacks sufficient lithium ion selectivity to be practical. To address this challenge, we introduce a new class of polymeric membranes that incorporate ion binding sites which significantly increase the selectivity of Li⁺ over Na⁺. These studies suggest important design rules to enhance the efficiency of membrane separations for lithium recovery and highlight the potential utility of incorporating specific interactants into polymer materials.

Introduction
Lithium is a critical element in contemporary energy applications due to its pervasive use in electrochemical technologies (1–3). For example, lithium-ion batteries dominate the rechargeable market due to the light weight, large reduction potential, and high energy density of lithium (4, 5). Societal demand for lithium will continue to rise as mobile technology expands, especially with the increasing use of electric vehicles (6–9). The majority of lithium is currently mined from pegmatite deposits and close-buried brines, with brines estimated to contain ~3% of the world’s identified lithium reserves (10). Unfortunately, the extraction of lithium from brines necessitates concentration by slow evaporation, a process that can take over a year (11, 12). An alternative source of lithium with concentrations comparable to brines (e.g., 100–1000 mg/L) (12–14) is the vast volume of produced water (10.6 billion liters per day in the U.S. in 2017) generated from oil and gas operations (15), although lithium recovery from these wastewater streams is uncommon. The development of new, energy-efficient separation techniques with higher

Mechanical Testing and STEM. Samples for mechanical testing and STEM were heat pressed using a Carver press (Waukesha, WI) into a 0.5 mm thick sherd rectangular mold with 3000 bar at 200°C for 15 minutes and then quenched to room temperature. For STEM, polymers were cut into thin sections (~100 nm) with cryo-ultramicrotome at -100°C and emerged without drying. For both monotonic and step-cyclic tensile tests, a dog bone cutting was used to punch out samples of the correct geometry (gauge depth = 0.5 mm, gauge width = 1.5 mm, gauge length = 10 mm, 2.5 mm transition zone radius). Tests were performed using using a custom-built setup with a vertical TensilTest positioning table (Listech, CA) and a 10 N load cell (LVD1000 Maxitester 8-Bar, FRUTER, CA). A deformation rate of 10 mm/min was used for all tests (strain rate = 1 min⁻¹). Step-cyclic tensile tests were brought to zero force between cycles by increasing the minimum applied strain in the specimen were decreased.
With the synthetic modularity, tunability of photophysical and chemical characteristics, and the large range of photoswitches available at this time, these light-responsive organic molecules are extensively applied within many fields from materials science to medicine and device development. Moreover, this field continues to expand with the need to create and apply organic photoswitches with specific physical characteristics (e.g. solubility in more polar solvents or water solubility for biological applications) or to improve the characteristics of photoswitches (e.g. reversibility, stability of metastable isomer after irradiation, improving PSS) through careful synthetic design.  

1.3 An introduction to azobenzene, a dye compound with wide application

Azobenzene, a diazine derivative with phenyl groups on both ends, has been a substantial choice within the organic photoswitch literature for creating light-responsive organic materials. This is due to azobenzene’s ease of synthesis and reversible change in steric and electronic properties with isomerization. This isomerization occurs between a trans-isomer (phenyl rings are on opposite sides of the N=N bond) and a cis-isomer (phenyl rings on the same side of the N=N bond) (Figure 1.6). Discovered in 1834 by Eilhard Mitscherlich, azobenzene (trans) was initially applied to the dye industry as it was found that azobenzene dyes did not fade with ambient light exposure and offered a range of colors with installation of substituents on the phenyl ring. In 1937, G. S. Hartley reported the existence of a second form upon exposure to sunlight that was “much more in favour of the more polar [solvent],” concluding to be the more polar cis-isomer of azobenzene. In addition to increased solubility in polar solvents, cis-azobenzene was also found to yield a higher
In recent years, bottlebrush copolymers have emerged as a promising non-linear architecture for achieving novel materials properties. Bottlebrush copolymers are composed of polymeric backbone with densely grafted and chemically similar polymeric side chains, and can be easily prepared by ring-opening metathesis polymerization (ROMP). Bottlebrush copolymers differ from comb and other branched polymers in that the grafting density is sufficiently high to cause a large degree of steric crowding around the backbone. As a result of this crowding, the sidechains and backbone adopt an extended conformation, leading to a low degree of entanglement. A stretched conformation and large domain spacing in block brush copolymers. Bottlebrushes have interesting physical and mechanical properties that make them attractive materials for a diversity of applications: photonics, drug delivery, battery membranes, lithography, and dielectric elastomers.
References

Be consistent and double check journal names, titles, etc., **even if you use reference software!**

Use CASSI journal abbreviations

https://cassi.cas.org/search.jsp


These are not the journal names (although they came from downloading the references!)

Common Pitfalls

- Size of a space after subscript/superscript

<table>
<thead>
<tr>
<th>Table S1. Molecular characterization data for P4MCL-b-PDDA-b-PTFEA parent triblock terpolymers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry</td>
</tr>
<tr>
<td>LDF-22</td>
</tr>
<tr>
<td>LDF-19</td>
</tr>
<tr>
<td>LDF-43</td>
</tr>
<tr>
<td>LDF-18</td>
</tr>
<tr>
<td>LDF-17</td>
</tr>
</tbody>
</table>

- Punctuation after italicization or bolding


Ellipsis and two commas have been unintentionally bolded before/after the name of interest

Notice the space to the left of × is more balanced with the space on the right (no longer unintentionally subscript)
Common Pitfalls

- Inconsistent title capitalization

**Title case**

Title case means *the first letter of each word is capitalized*, except for certain small words.

This is the Title of My Paper

**Sentence case**

Sentence case means *only the first letter of the first word is capitalized* (plus proper nouns).

This is the title of my paper
Common Pitfalls

- Don’t use possessive nouns for inanimate objects

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Chapter 1. **Azobenzene’s potential utility in photoresponsive ionic materials**

1.1 The advent and advantages of stimuli and light-responsive polymeric materials.

Polymers are essential to our everyday life, from the countless plastic products we use (containers, bags, shoes, cups, plates, TVs, cars, etc.), to directing and underlying our biological life (DNA, RNA, proteins). Elucidated by Hermann Staudinger in 1920, a polymer or *Makromoleküle* is a “long thread-shaped molecule,” high molecular weight molecule consisting of similar subunits bonded together (known as monomers)\(^1\) (**Figure 1.1**). Since Staudinger’s founding of the field of polymer chemistry and Nobel Prize in 1953 for his discoveries in the field of macromolecular chemistry, the study and understanding of polymers and the variety of polymeric structures we can synthesize has significantly expanded, with synthetic methods to control the branching, the degree of polymerization (and length of the polymer), and attach the functional groups to imbue polymeric materials with specific chemical and physical properties.\(^2\)

![Azobenzene molecule](image)
Pasting from Microsoft Excel can screw up subscript/superscript alignment

Table 1: Summary of Physical Characterization of PLLA-PMCL A(BA')ₙ Miktoarm Star Polymers

<table>
<thead>
<tr>
<th>Star</th>
<th>$f_A^a$</th>
<th>$M_{n,A}^b$</th>
<th>$M_{n,B}^b$</th>
<th>$M_{n,A'}^b$</th>
<th>Target $n$</th>
<th>$n^c$ vs. $n^c$</th>
<th>$\tau^d$</th>
</tr>
</thead>
<tbody>
<tr>
<td>98(32-8)₉</td>
<td>0.33</td>
<td>98</td>
<td>32</td>
<td>7.5</td>
<td>9</td>
<td>8.5</td>
<td>0.93</td>
</tr>
<tr>
<td>98(32-8)₆</td>
<td>0.40</td>
<td>98</td>
<td>32</td>
<td>7.5</td>
<td>6</td>
<td>5.6</td>
<td>0.93</td>
</tr>
<tr>
<td>98(32-8)₃</td>
<td>0.52</td>
<td>98</td>
<td>32</td>
<td>7.5</td>
<td>3</td>
<td>2.9</td>
<td>0.93</td>
</tr>
</tbody>
</table>

$^a$Calculated from $^1$H NMR using $\rho_{PLLA} = 1.25$ g cm$^{-3}$ and $\rho_{PMCL} = 1.03$ g cm$^{-3}$. $^b$Determined from $^1$H NMR chain-end analysis. $^c$Determined from volume fraction and $M_n$ vs. $M_n$. $^d$Calculated from $M_{n,A}/(M_{n,A} + M_{n,A'})$. 
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<th>Target $n$</th>
<th>$n^c$</th>
<th>$\tau^d$</th>
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<tbody>
<tr>
<td>98(32-8)_5</td>
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<td>98</td>
<td>32</td>
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<td>9</td>
<td>8.5</td>
<td>0.93</td>
</tr>
<tr>
<td>98(32-8)_6</td>
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<td>98</td>
<td>32</td>
<td>7.5</td>
<td>6</td>
<td>5.6</td>
<td>0.93</td>
</tr>
<tr>
<td>98(32-8)_3</td>
<td>0.52</td>
<td>98</td>
<td>32</td>
<td>7.5</td>
<td>3</td>
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<td>0.93</td>
</tr>
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$^a$Calculated from $^1$H NMR using $\rho_{PLL}=1.25 \text{ g cm}^{-3}$ and $\rho_{PMCL}=1.03 \text{ g cm}^{-3}$. $^b$Determined from $^1$H NMR chain-end analysis. $^c$Determined from volume fraction and $M_n$. $^d$Calculated from $M_{n,A}/(M_{n,A}+M_{n,A'})$. 
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<thead>
<tr>
<th>Star</th>
<th>ƒₐ</th>
<th>⁹ₘₐ</th>
<th>⁹ₘₖ</th>
<th>⁹ₘₐ'</th>
<th>Target n</th>
<th>[n] vs. ₙ</th>
<th>⁹₋</th>
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⁹Calculated from ¹H NMR using ρ_PLLA = 1.25 g cm⁻³ and ρ_PMCL = 1.03 g cm⁻³. ⁶Determined from ¹H NMR chain-end analysis. ⁷Determined from volume fraction and ⁹ₙ vs. ₙₙ. ⁹Calculated from ⁹ₙₐ/⁹ₙₐ + ⁹ₙₐ'.
If your lines of text look inconsistently spaced, something weird is going on!

RESULTS AND DISCUSSION

Previously, we have discovered A15 in single-component diblock copolymer melts comprising poly(dodecyl acrylate) (PDPA) and poly(lactide) (PLA) blocks. SCFT study revealed that extreme conformational asymmetry between PDPA and PLA stabilized the A15. Our new question was whether A15 could be still observed and phase behavior would be changed when a simple but conformationally asymmetric diblock copolymer forms more complex architecture like \((AB)_n\) star block copolymers. To answer this question, we designed a new diblock copolymer poly(dodecyl acrylate)-\textit{block}-poly(trifluoroethyl acrylate) (PTFEA) (Figure 2). Instead of lactide, TFEA was introduced as the second monomer for two reasons: i) PTFEA block can be prepared from photoinduced ATRP of TFEA, which allows the synthesis of complex star polymers due to its high control over molecular weight and dispersity, and end group fidelity; ii) short fluorinated side chain of TFEA would results in incompatibility with PDPA maintaining conformational asymmetry. Extent of asymmetric conformation and incompatibility can be quantified as ratio of statistical segment lengths \((z = b_\text{CH}/b_\text{AC})\) and interaction parameter \((\chi)\), respectively. First, to determine statistical segment lengths, we prepared PTFEA and PDPA homopolymers using photoinduced ATRP that proceeded under UV irradiation in the presence of an aliphatic tertiary amine ligand (Me$_3$Tren) and low concentrations of CuBr$_2$ (SI).
Common Pitfalls

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Some typesetting comes down to personal preferences and publisher style requirements.

The only choice that is wrong every time is *inconsistency*.  

Questions?