Writing a CAREER proposal

Christine K. Luscombe

Assistant Professor,

Materials Science and Engineering Department

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About me

- BA, MSci in chemistry (2000)

- PhD in organic chemistry (2003)

- Post-doc in organic chemistry (2004-2006)

- Assistant Professor in Materials Science and Engineering (Sept. 2006 -)

About me

- Completely naïve when I joined…
  - Had never written a single proposal
  - Had most of my education in the UK, so didn't have a clue about the American system
  - Becoming an Assistant Professor was more of an accident…
- But currently have 9 grants including NSF Career Grant and DARPA Young Faculty Award.

Identify the correct program

- Phone/e-mail/visit program officers
  - -If you're in DC, make an appointment to see them
  - -If you're shy (which I am), e-mail beforehand to set up a time for the phonecall

- Some programs are more supportive of young faculty than others

- Do what the program officer tells you to do!

- Although the funding is based on the reviews, the program officer makes the final decision

Proposal writing

- A good proposal needs to have:

A good idea + *Effective communication*

- Read successful proposals.

- Make it as easy as possible for the reviewers to figure out what you're trying to do.
  - -Use *italics*, **bold**, diagrams etc. etc.
  - -At the beginning of each section, have a boxed section summarizing the work

- Be shameless in self-promotion. Don't just rely on you CV.

Proposal writing

CAREER: Quasi-living polymerizations of semiconducting polymers: tailored microstructures for optimal energy harvesting

Christine K. Luscombe, Assistant Professor, Materials Science and Engineering Department, University of Washington, Seattle, WA 98195-2120.

1. PROJECT DESCRIPTION

Semiconducting polymers are actively under development for use in organic light-emitting diodes, thin-film transistors, and solar cells. However, their performance in many applications is limited by our ability to accurately control their syntheses and hence their structure and properties. We propose to develop and extend synthetic methodologies of organic semiconductor polymers so that we can obtain superior control over their shape, size, macromolecular structure, and optoelectronic properties. Using quasi-living polymerization techniques developed in our group, we will extend the technique to create variety of polymer structures including block copolymers, star-shaped polymers, and brush polymers. The optoelectronic properties of semiconducting polymers are known to be heavily dependent on their structures. By being able to control the shape and size of our polymers accurately, we will be able to obtain nanostructured photovoltaic devices with improved processing, better stability, and enhanced charge dissociation. The ultimate goal is to lay the foundation for the development of future generations of superior, energy harvesting devices that are flexible, cheap, efficient and easily manufactured.

Proposal writing

Educator plan

1) **Global virtual classrooms for middle school and high school students:** I will build upon my own international experience to develop a program for combining international education and the dissemination of the latest activities related to semiconducting polymers to the general public. (years 1-5+)
2) **Undergraduate curriculum development:** A course with a required writing program will be developed and integrated into a senior level course to improve student interest, communication skills, and writing skills to train them for future job opportunities. (years 1-5+)

5. RESEARCH PLAN

5.1 Quasi-living polymerization for semiconducting polymers

The ability to control the synthesis of semiconducting polymers is a crucial issue that needs to be addressed to achieve reproducible device performances. Without this, it will be difficult to realize the full potential of polymers and make them commercially viable. This section of the proposal focuses on the fundamental aspects of creating a controlled polymerization process, which is required to provide the basis for the latter part of the proposal, namely synthesizing materials to improve the performance of organic photovoltaic devices. The effect of monomer size, and initiator functionality will be studied, as well as the mechanism and kinetics of polymerization.

One of the biggest challenges associated with the synthesis of semiconducting polymers has been to develop a controlled polymerization method so that we have accurate control over the shape and size of the individual polymer chains, and therefore their macroscopic alignment which controls their optoelectronic properties. In the case of non-semiconducting polymers, which typically contain a saturated backbone, many controlled polymerization methods have been developed, including controlled radical polymerization methods such as atom transfer radical polymerization (ATRP)[44] and nitroxide mediated polymerization (NMP).[45] Other examples of controlled polymerizations include ring opening metathesis polymerization (ROMP)[46] and living anionic polymerization[47] amongst others. Polymers created using these polymerization methods result in a polymer with a narrow polydispersity index (PDI) as well as a molecular weight that can be predicted in advance. Another key aspect of these polymerization methods

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Proposal writing

summer, I will host two female undergraduate students in my laboratory for the NSF STC MDITR REU Program[25] at University of Washington, as well as participate as a lecturer for the NSF MRSEC GENSEC RET Program which targets Native American Tribal High Schools in the State of Washington.[26] I am also a mentor for the NSF STC MDITR mentoring program[27] and the Department representative for the College of Engineering Diversity Committee.

Although the MSE department at the University of Washington is a small department, we have a large undergraduate program (among the five largest programs nationally, the largest west of the Rockies with the highest ratio of BS degrees awarded per faculty nationally). As such, my classroom teaching experience has been extensive since my arrival in the Fall of 2006. I have taught a senior undergraduate level course "Introduction to Polymer Science and Engineering" (MSE 471, fall quarter 2006, adjusted median teaching contribution score of 4.3/5.0, the highest in the department for this academic year), and I am currently teaching a graduate level course "Organic Electronic and Photonic Materials/Polymers" (MSE 599/CHEM 584, spring quarter 2007) offered jointly to the Chemistry and Materials Science and Engineering Departments. This is a course that I have developed for the educational program at the NSF-STC Materials and Devices for Information Technology and Research (MDITR)[27] based at the University of Washington. This course is designed to promote interdisciplinary learning while introducing important aspects of organic materials in photonic and electronic devices. During the following academic year, in addition to teaching the courses described above, I will be teaching "Introduction to Materials Science and Engineering" (MSE 170) which is a required course for many departments in the College of Engineering.

Proof reading

- Have at least 2 people read your proposal

    1. An expert in your field

    2. A related expert in your field

    3. A non-expert