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Piezoelectric Bombyx mori Silk films as a biocompatible sensor

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Finding biocompatible and biodegradable substrates for biomedical engineering applications continues to be a major focus today. *Bombyx mori* silk has received attention as a useful biopolymer for its remarkable mechanical properties, biocompatibility and the high level of control over degradation rates; moreover, the degradation products are amino acids the body can reuse. It has been found that native silk fibers display piezoelectricity rivaling that of quartz, and more recently the piezoelectric effect has been recreated in regenerated silk fibroin films. A zone drawing technique has been used to induce β-sheet alignment as well as increase β-sheet content, key components to piezoelectric silk films. A modified dynamic mechanical analyzer was used to measure current and voltage under applied stress, and piezoelectric strain and voltage constants were calculated. Performance of films treated to induce water insolubility has been examined to find optimal processing parameters. By altering post treatments, it is possible to reach piezoelectric strain constants rivaling synthetic polymers such as poly-L-lactic acid. The successful demonstration of piezoelectric films made from biological polymers offers exciting ideas for future biomedical sensing applications.

Biography

Kathleen Martinick received her B.S. degree in chemical engineering from the University of New Mexico, and is currently completing her Master of Science in bioengineering at Tufts University. She has previously held technical internships at Harvard University and Sandia National Laboratories.

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