Chapter 7: Maximizing Strain Rate and Power

How fast can conducting polymers actuators contract? The results shown in Chapter 5 and those of other authors indicate that while large forces and moderate strains are achievable, the strain rate and power of conducting polymer actuators are poor. The paper that follows* describes a method for dramatically increasing the speed, strain rate and power of conducting polymer actuators. A theory explaining the method is presented in Chapter 8. Apart from increasing strain rate and power to mass by more than a factor of 30 over what has previously been reported, there are several other notable contributions presented in the paper. Bilayer actuators are demonstrated that achieve over 100 000 cycles, by far the largest number of cycles yet obtained from conducting polymer actuators. Also, an encapsulated bilayer design is presented which allows operation outside a liquid environment.

In the original thesis a copy of an article in Synthetic Metals follows (Madden; Cush; Kanigan, and Hunter 2000).

Reference List

1. Madden, John D.; Cush, Ryan A.; Kanigan, Tanya S., and Hunter, Ian W. Fast contracting polypyrrole actuators. Synthetic Metals. 2000 May; 113:185-193.

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* Part of the evaluation of a thesis involves determining the contributions of the thesis author. The paper that follows has multiple authors, each of which made important contributions to the work. The development of the fast actuation method is John Madden's contribution. John Madden and Ryan Cush together implemented and tested the method on bilayers. John Madden performed the linear actuator tests and wrote the article.