C 133

Artificial muscles based on conducting polymer polypyrrole

Systems which are capable of converting electrical energy into mechanical energy can be defined as actuators, or more specifically in the case of softer materials, artificial muscles (AM). In this study we have characterized using deflection and force measurements. Fabrication of bilayer muscles was done on a strip of polyimide film. To get the electrical contacts, the polymer strip was coated with a gold layer. Deposition of PPy on the strip was done electrochemically using sodium dedeylbenzenesulfonate electrolyte. Defection measurements ere done by applying a potential in an electrochemical cell containing sodium perchlorate. To measure the force, the free end of the muscle was connected to a microbalance. Force variation with respect to the applied potential (-0.85 to 0.30 V) and the cyclic voltammogram were simultaneously recorded. Deflection measurements showed that during the oxidation of the PPy film, (lower potentials) deflection increased and at higher potentials deflection decreased. This increment may due to contraction of PPy film as a result of release of cations and the decrement due to expansion of the film as a result of insertion of anions. Force measurements on bilayer muscles showed that

the force changes are always associated with peak positions of the cyclic voltammograms. It is very important to note that almost all the force is generated in a rather narrow voltage interval. This is an important implication of these Am.