277b Polymeric Microactuators for Responsive Drug Delivery Systems

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The development of novel polymeric actuators with fast, reproducible, and reversible actuation at physiological pH environments under low power requirements is of great importance nowadays. Such systems can find a wide range of applications, including the development of bio-micro-electro-mechanical systems (BioMEMS) for biological and medical applications. In this presentation we will discuss the development of polymeric micro- and nanoscale actuators based on two different strategies. First, polymeric actuators composed of the electroactive polymer polypyrrole (PPy) deposited on top of gold layers have been microfabricated. These actuators are made in the shape of micro and nanoscale flaps fixed on top of microvials. Under electroactuation the polymeric actuators bend, acting as microvalves, and opening the top of the reservoirs. These microactuators are able to electroactuate with a fast response time at neutral pH environments under low power requirements. On another approach, an electroactive polymeric actuator based on acrylic acid, acrylamide and PPy/carbon black composite has been developed. This polymeric actuator acts as an artificial muscle, bending on demand under the application of low voltage with a fast response time. The biocompatibility, low power requirements and ability for fast electroactuation at neutral pH environments make both polymeric actuator systems suitable for numerous biological and medical applications, including the development of responsive drug delivery systems.