World Academy of Science, Engineering and Technology
International Journal of Electronics and Communication Engineering
Vol:11, No:10, 2017

Modelling of Rate-Dependent Hysteresis of Polypyrrole Dual Sensing-Actuators for Precise Position Control

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Abstract : Bending dual sensing-actuators based on electroactive polymers are faradaic motors meaning the consumed charge determines the actuator's tip position. During actuation, consumed charges during oxidation and reduction result in different tip positions showing dynamic hysteresis effects with errors up to 25%. For a precise position control of these actuators, the characterization of the hysteresis effect due to irreversible reactions is crucial. Here, the investigation and modelling of dynamic hysteresis effects of polypyrrole-dodezylbenzenesulfonate (PPyDBS) actuators under ambient working conditions are presented. The hysteresis effect is studied for charge consumption at different frequencies and a rate-dependent hysteresis model is derived. The hysteresis model is implemented as closed loop system and is verified experimentally.

Keywords : dual sensing-actuator, electroactive polymers, hysteresis, position control
Conference Title : ICSAM 2017 : International Conference on Sensors, Actuators and Microsystems
Conference Location : Barcelona, Spain
Conference Dates : October 30-31, 2017