

# EAP Actuator With Enhanced Force Using a Parallel Combination of Polypyrrole and Solid Polymer Electrolyte Films that Work in Air

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## ABSTRACT

Conductive polymers are typically made as films, and consequently they show very small bending stiffness and mechanical energy. Thus, even though these polymers potentially develop large stress and forces (stress: 6.8 MPa and force: 5 N/mm), the inherent flexibility of the films curtails the overall effectiveness of actuators that are based on conductive polymers. In this study, we are investigating the possibility to maximize the force that is induced by these actuators by optimizing its properties and configuration to obtain a bending with large forces.

A number of Polypyrrole//Solid Polymer Electrolyte//Polypyrrole [PPy//(SPE)//PPy] trilayers were linked in parallel to obtain a multilayered configuration in an effort to linearly increase the force with the number of trilayers. Series (Figure 1a) and parallel (Figure 1b) electrical contacts between trilayers were compared and the conversion of electric energy to mechanical energy was quantified to select effective configuration. Also, the relationship between mechanical force developed by a multilayer and the number of [PPy//(SPE)//PPy] trilayers was determined.

