Polypyrrole/carbide-derived carbon composite in organic electrolyte: Characterization as a linear actuator

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Résumé en anglais	Polypyrrole (PPy) doped with dodecylbenzenesulphonate (DBS) (PPy/DBS) was polymerized with the addition of phosphotungstic acid (PTA), thus, incorporating multicharged phosphotungstate anions (PT) to give PPy/DBS-PT films. With carbide-derived carbon (CDC) particles included, the obtained films contained CDC-PT, DBS and PT anions forming PPy/DBS-CDC-PT (PPy/CDC). Our goal was to test the applicability of the material for actuation in an organic electrolyte. The material properties of PPy/CDC films, such as conductivity, charging/discharging and actuation as strain and strain rate were significantly changed in comparison to PPy/DBS-PT films. FTIR (Fourier transform infrared) and EDX (energy dispersive X-ray) spectroscopy revealed that CDC-PT is incorporated in the PPy films and the SEM (scanning electron microscopy) images showed a more porous film with CDC particles packed into PPy. Electro-chemo-mechanical deformation studies (ECMD) revealed that PPy/CDC films had anion-dominated actuation resulting in nearly 6 times higher strain, 2 times higher force, higher strain rates, and 7 times higher conductivity than PPy/DBS-PT films, which had mixed ion transport and rather poor strain and stress behavior. Thus, only one of the two materials - PPy/CDC – could have some practical use in this type of electrolyte solutions.
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Liens
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