

Electrochemical Formation of Conducting Polymer Nanocomposites on Nano-Porous Substrates

Kenji Machida, Yosuke Ota, and Katsuhiko Naoi*
Center of Future Nano-materials, Institute of Symbiotic Sciences and Technology, Tokyo University of Agriculture and Technology
2-24-16, Naka-cho, Koganei, Tokyo 184-8588, Japan
k-naoi@cc.tuat.ac.jp

The authors have attempted to form conducting polymer nanocomposites on nano-porous substrates for supercapacitors or electrolytic capacitors with high performance.

Conducting polymers like poly(3,4-ethylenedioxythiophene) or polypyrrole (PPy), were found to form successfully on a nano-porous Ta substrate covered with electrogenerated dielectric-Ta₂O₅ thin layer(3-10 nm). The conducting polymer and the dielectric-Ta₂O₅ nano-layer were formed simultaneously by electrooxidizing the nano-porous Ta substrate in a surfactant aqueous electrolyte under pulse galvanostatic mode. A conducting polymer, polypyrrole, formed on the nano-porous Ta covered with the dielectric-Ta₂O₅ layer (**Figure 1**) can be applied to solid electrolytic capacitors with high capacitance and low ESR.

For another example, electrochemical formation of conducting polymers on the nano-porous materials, such as activated carbons, carbon blacks, or conducting metal oxides, will be introduced and discussed as an electrode material for the next generation supercapacitors.

Acknowledgement

The work reported here is a part of the 21st. Century COE (Center of Excellence) program of "Future Nano-Materials" research and education project, which is financially supported by Ministry of Education, Science, Sports, Culture, and Technology through Tokyo University of Agriculture and Technology.

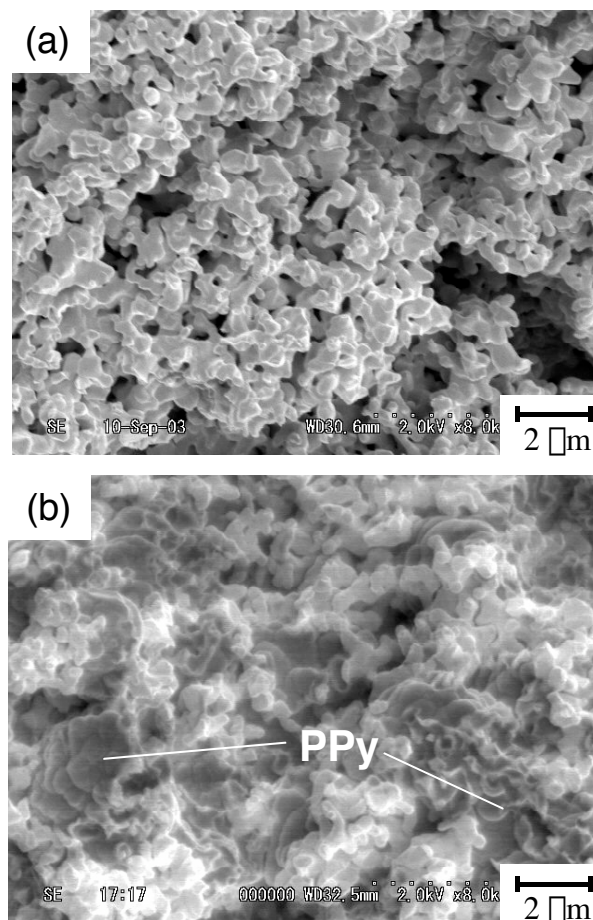


Figure 1 Cross-sectional SEM images of a) nano-porous Ta substrate (b) Ta/Ta₂O₅/PPy nanocomposite formed after pulse anodization.