SYNTHESIS AND CAPACITIVE PROPERTIES OF COMPOSITES BASED ON POLYANILINE DEPOSITED AT FREE-STANDING SINGLE-WALLED CARBON NANOTUBES

[a]Panasenko Iu.V., [b]Bulavskiy M.O., [a,b,c]Iurchenkova A.A., [d]Aguilar-Martinez Ye., [b]Fedorov F.S., [a,c,e]Fedorovskaya E.O., [f]Mikladal B., [c]Kallio T., [b,c]Nasibulin A.G.

[a]Novosibirsk State University, Novosibirsk, Russia
[b]Skolkovo Institute of Science and Technology, Moscow, Russia
[c]Aalto University, Aalto, Finland
[d]Uppsala University, Uppsala, Sweden
[e]LUT University, Lappeenranta, Finland
[f]Canatu ltd, Vantaa, Finland

Flexible and lightweight supercapacitors are being actively developed to meet the growing demands of modern wearable electronics, and, also, to enable easy rolling-up packaging to make devices with high nominal values. Single-walled carbon nanotube (SWCNT) films are well-known materials for applications in flexible, wearable devices. However, using the films only might be challenging due to their insufficient capacitance being originated from double electrical layer charging. A great improvement might be approached by making composites with materials that possess pseudocapacitive properties, like a soft mater, polyaniline (PANI) polymer. Still, the synthesis of PANI over SWCNTs needs adjustment to ensure the best functional properties [1].

Here, we study the synthesis and capacitive properties of supercapacitors based on PANI electrochemically deposited on free-standing films of SWCNT.

The utilized SWCNT films served as a substrate for PANI in situ deposition, to be later applied as a current collector, thus, ensuring "dead-weight" free flexible supercapacitor architecture. The structure and morphology of synthesized material have been evaluated by means of several techniques, like Raman spectroscopy, scanning, and transmission electron microscopy. Capacitance performance was assessed by cyclic voltammetry, galvanostatic charging-discharging, etc. Our results suggest that the thickness of the SWCNTs plays a crucial role in capacitance and its retention depending on the way contacts are realized, i.e. via SWCNTs or PANI. The maximum achieved specific gravimetric capacitance reaches 541 F g^{-1}.

References

1. Panasenko Iu.V. et. al. / J. Power Sources. 2022. Vol. 541. P. 231691.