ENHANCED CAPACITANCE OF MULTI-WALLED CARBON NANOTUBES ELECTRODES WITH REACTIVE PLAMSA ETCHING

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Owing to their excellent electrical properties and high surface area, multi-walled carbon nanotubes (MWCNTs)-based electrodes are promising for applications such as electronic biosensing and energy storage. However, the relatively inert graphitic walls that intrinsic MWCNTs possess often prevent high energy density, limiting the energy storage capability of MWCNTs-based electrodes. The modification of MWCNTs through reactive ion etching (RIE), a common technique in semiconductor processing, recently showed ability to enhance the charge capacitance and energy density[1]. Here, the effects of various RIE process parameters, including reactive gas species, plasma energy, and processing time, are systematically investigated, and the total capacitance of RIEmodified

MWCNTs-based electrodes are quantitatively measured through electrochemical methods. The enhancement in capacitance is related to the large number of defects and reactive sites on graphitic walls induced by different elementary processes in the partially ionized plasma, which can then be optimized for high performance MWCNTs-based electrodes.

1. M. Hoefer and P. R Bandaru, “Determination and enhancement of the capacitance contribution in carbon nanotube based electrode systems”, Appl. Phys. Lett. 2009, 95, p. 183108.