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Direct growth of MWCNTs on modified stainless steel surface for flexible lithium ion batteries

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Abstract

Multi-walled carbon nanotubes (MWCNTs) were grown directly on a modified surface of stainless steel foil (304 SS) using thermal chemical vapor deposition (CVD). Before the MWCNT growth, the polishing procedure followed by the oxidation treatment on 304 SS was considered as a modified process. To understand the effects of this modification on the growth of MWCNTs, the as-received 304 SS and the polished 304 SS without oxidation treatment were further investigated for comparisons. Scanning electron microscopy, transmission electron microscopy, Raman spectroscopy and X-ray diffraction were used to study the morphology of MWCNTs and their substrates. It was found that the good quality and the dense growth of MWCNTs were grown on the modified 304 SS. Furthermore, the electrochemical measurements were performed within 1M LiCl electrolyte to assess the possibility to use the MWCNTs coupled to 304 SS as electrode material. The optimum oxidation period for the representative capacitive behavior of MWCNTs grown on polished 304 SS is 45 seconds. This finding may lead to a pre-process for improving the MWCNTs grown on metal alloy substrates used for flexible electrode in lithium ion batteries (LIBs) and other flexible electrode works.

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Keywords: Multi-walled carbon nanotubes; Chemical vapor deposition; Flexible lithium ion batteries; Stainless steel; Modified surface

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