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How carbon nanotubes functional groups influence copper electrodeposition for electrical transmission?

Ultraconductive copper-carbon nanotubes composites are novel advanced materials for fabrication of lighter and more stable electrical wires to provide more efficient energy transport. To overcome the limitation of copper and CNTs incompatibility various types of pre-functionalised nanotubes were used. The dynamics of electrochemical deposition and dissolution of copper in the presence of amine- and carboxylic- functionalized multiwalled carbon nanotubes has been studied in detail using an electrochemical quartz crystal microbalance. It was found that carbon nanotube functionalization has critical influence on the values of mass and current densities of copper deposition. Presence of amine functionalization increases competitive hydrogen evolution without significantly affecting the total amount of deposited copper, whereas carboxylic groups clearly enhance deposition of larger amounts of smoother copper deposits. Molar mass analysis of deposited species reveals interactions of carbon nanotubes with the electrode surface dependent on the type of functionalization. In the light of present results, the effect of carbon nanotube functionalization should be closely considered in the development of electrochemical strategies for the integration of carbon nanotubes in metallic copper.

Biography

Ewa Kazimierska is Ser Cymru II Recapturing Talent Fellow working in Energy Safety Research Institute at Swansea University in Wales, UK. She came back to academia after prolonged career break and the key research goal of her current project is to develop the next generation materials for electrical power transmission. Her interest is in the integration of carbon materials in metals aiming to develop ultraconductive copper-carbon nanotube composites. She has completed her PhD from City University of New York and Postdoctoral studies from Dublin City University. She completed her Master studies from Warsaw University.

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