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Decoration of nickel nanoparticles on multiwalled carbon nanotubes and testing the electrocatalytic activity on methanol/ethanol oxidation for fuel cell application

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The efficient and cost effective electrocatalysts are of great interest for energy application due to the high cost and other associated problems of the existing ones. Here, in this work, the preparation of efficient electrocatalyst/substrate system by electroless deposition of non-noble metal nanoparticles, in particular the Ni/Multiwalled Carbon nanotubes(MWCNTs) has been prepared and tested for Methanol and Ethanol oxidation. The MWCNTs were synthesized by solvothermal procedure at a low temperature range of about 180–220°C in an autoclave system. The products were characterized by high-resolution transmission electron microscopy, powder X-ray diffraction, energy dispersive X-ray analysis and X-ray photoelectron spectroscopy. The Nickel nanoparticles with a size range of 5-10 nm were distributed almost uniformly on the surface of MWCNTs. The Ni/MWCNTs electrode has exhibited remarkably higher current density of 145 mA/cm² and a lower onset potential of -0.3 V in 0.1M CH₃OH with 0.1 M H₂SO₄. The calculated average active surface area of MWCNTs and Ni/ MWCNTs' electrode are 0.45 x 10⁻³ cm² and 0.51 x 10⁻³ cm² respectively and the surface coverage of Ni/MWCNTs' electrode was 2.4409×10⁻⁷ mol/cm². A significant electrocatalytic activity of Ni/MWCNTs for the oxidation of methanol and ethanol in acidic medium has been observed, which could be a positive result to be harnessed as a non-noble electrocatalyst/electrode system to improve the efficiency of the direct alcohol fuel cells.

Biography

Krishnamurthy G has completed his MPhil and PhD from Bangalore University after his Master's in the same University. He is having a total of 16 years of teaching experience. During his tenure as Sir C V Raman Post-doctoral Fellow (2013-2014), he visited Lawrence Berkely National Laboratory, Berkely, CA, US. His research interests lie in nano/energy materials, electrochemistry, bio-medical materials, etc. He has published 28 papers in reputed journals and guided PhD students. He is a reviewer of several reputed international journals.

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