

ELECTROCHEMICAL CHARACTERIZATION OF NANOCOMPOSITE CARBON AEROGELS

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Carbon aerogels are promising electrode materials for energy storage devices [1,2]. In fact “Cooper Electronics” commercializes carbon aerogel capacitors. They have very attractive properties such as high electrical conductivity, high porosity, low density and a large specific surface. In our group, carbon aerogels containing palladium nanoparticles were prepared by sol-gel polymerization, dried with supercritical CO₂ and pyrolysed at 1050 °C under N₂ atmosphere. The distribution and the size of the particles in the aerogel were controlled by transmission electron microscopy. These materials have showed good results as catalysts in Mizoroki-Heck and Sonogashira coupling reactions [3] and in hydroxycarbonylation of aryl iodides [4].

The electrochemical properties of nanocomposite carbon aerogels were examined, by studying the electroreduction of nicotinamide in a non aqueous solution by cyclic voltammetry. A three electrode electrochemical cell where the working electrode was a carbon aerogel with monolithic shape, a platinum plate was used as the counter electrode and a platinum wire as a quasi-reference electrode was used for that purpose. The electrolyte solution was nicotinamide, TBABF₄ and acetonitrile. All the experiments were carried out at room temperature. Cyclic voltammetry was conducted between -2 and 0 V vs Pt for several scan rates ranging from 5 to 150 mV.s⁻¹. The current density is strongly enhanced compared to graphite working electrodes.

Experiments with carbon aerogels containing palladium, nickel and copper nanoparticles are in progress. These elements are good candidates as electrodes in catalysis, batteries, etc, because of the nanosized metal particles held within.

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