Public Abstract

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Title:SYNTHESIS AND APPLICATIONS OF SILVER AND PALLADIUM METAL NANO FOAMS

Nanoporous metal foams (NMFs), a relatively new class of materials with low-density, high surface area and conductivity, have been studied recently in nano science. These materials can be engineered to benefit many fields and promise to enable new technologies in areas such as hydrogen storage, high power density battery, surface-enhanced Raman spectroscopy and supercapacitors. Herein a new developed method is presented to synthesis low-density, NMFs of silver and palladium. This study is mainly focuses on the synthesis process of NMFs of and it also provides some new applications both are useful in research and daily life.

Silver NMFs were produced by mixing silver nitrate mixed with ethylene glycol, ethanol, and a reducing agent, and heating at 150 W of 5min using a CEM microwave. Higher conversions for this process were obtained using either hydrazine or sodium borohydride as the acceptable reducing agent for this redox reaction. Palladium NMFs were synthesized in the same way provided above with either hydrazine or sodium borohydride as the reducing agent.

Silver NMFs were applied in surface-enhanced Raman spectroscopy (SERS) as a substrate material. This material can significantly enhance the signal of the rhodamine 6G (R6G), an analyte used for detection. The limit of detection for R6G was found to be 2×10^{-6} M with the presence of this silver NMFs. Palladium nanoporous metal foam was found to degrade methyl orange (MO). An aqueous MO solution will turn nearly colorless after only 10 h of mixing with 0.03 g of palladium nanoporous metal foam at room temperature. This application is applicable to the treatment of liquid waste and water purification and is thus conducive to improving the environment.