Copper impregnated activated carbon for gas storage applications

Alfonso Policicchio

Department of Physics, University of Calabria, 87036 Arcavacata di Rende (Cs), Italy

Abstract

The growing energy demand and the need to decrease the environmental effects from the use of fossil fuels have led to the study of new clean fuels and smart solutions. In particular, attention is paid to alternative energy sources such as hydrogen (H2) and methane (CH4) who show lower atmospheric emission and higher availability then conventional petroleum, and to new solutions to carbon capture and storage. The main problems in those fields are related to the possibility to store gases efficiently and in safe conditions (i.e. low pressure) and to allow its use in everyday life. Up to now, different materials have been studied for those applications (e.g., zeolites, metal organic frameworks, etc.) even if all of them own different limitations such as relatively high thermal stability, slow adsorption/desorption kinetics, unstable structures, irreversibility on cycling and/or expensive production costs. Among the investigated adsorbents, carbon-based nanostructures with high specific surface area, such as activated carbon (Ac), are considered promising materials thanks to robust structure, tunable porosity, lightweight, high thermal/chemical stability and easy production. Their synthesis is governed by the choice of different parameters e.g. raw materials, pyrolysis process, and temperature, time etc. This study reports the development and characterization of activated carbon synthetized starting from amorphous cellulose (economic and environmentally friendly solutions) with and without the inclusion of copper (Cu) nanoparticles. The aim is to investigate how the presence of different concentration of metal nanoparticles affects porosity formation process and gases storage properties in terms of both maximum uptake and reversibility.