HYDROGEN STORAGE IN NICKEL DOPED MCM-41

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Hydrogen as an energy carrier is one of the best environmentally friendly alternatives to fossil fuel sources. The potential use of hydrogen results with increasing demand to hydrogen production and storage. Recent studies show that materials having high surface area, large pore size and high affinity to hydrogen have high hydrogen storage capacity. MCM-41 is silica based material having such properties and its hydrogen sorption properties can be improved by doping transition metals to the structure. Ni was chosen for this purpose as it is known with its hydrogen affinity. In this study, different amounts of Ni doped in MCM-41 that was produced by microwave heating to examine hydrogen storage capacity of Ni doped MCM-41 systems. The morphology and structure of the material was characterized by scanning electron microscope and X-ray diffraction analysis. Thermal stability of MCM-41 was examined by thermogravimetric analysis and it was seen that MCM-41s are hydrothermally stable. Surface area, pore size and adsorption capacity of MCM-41 were measured by Brunauer-Emmett-Teller (BET) method. It was observed that the material had large surface area around 1000 m^2/g and roughly 2 nm pore size. It was found materials have uniform pore structure with hexagonal well-ordered arrangement. BET surface area, pore volume and pore diameters decreased as the metal loading increased. The hydrogen adsorption capacity measurements were achieved by the Intelligent Gravimetric Analyzer at room temperature and up to 10 bar pressure. It was observed that the hydrogen storage capacity of MCM-41 is strongly affected by metal doping.