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Cobalt hydroxide nanorings: From synthesis, characterization toward electrochemical energy storage

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With surging the environmental problem and global energy crisis, the demands for clean, regenerative, and sustainable energy supplements are increasing in recent years. $Co(OH)_2$ NPs have been attractive since the beginning of the nanotechnology due to their characteristics such as additive in batteries, supercapacitor, catalysis, etc. We have developed a route toward the synthesis of $Co(OH)_2$ NPs, which does not require any template or surfactant, with enhanced electrochemical energy storage performance with high capacitance retention capability. The physicochemical features of the as-prepared $Co(OH)_2$ nanorings were characterized by transmission electron microscopy (TEM), X-ray diffraction (XRD), scanning electron microscopy (SEM) and nitrogen absorption–desorption. Structural characterizations represents an excellent mesoporous structure for the as-prepared $Co(OH)_2$. Due to its especial structure, the as prepared $Co(OH)_2$ NPs posing a high porosity for better electrolyte accessibility along with large surface area for higher electrochemical reaction rates. As a result, the NPs exhibited an excellent electrochemical capacitor performance. Moreover, this simple, low cost, reproducible friendly synthesis process, reported herein, could be extended to the controlled synthesis of other functional hydroxide NPs with well-defined morphologies and shapes. The ease of the precipitation production of these NPs could be scaled up to industrial-scale manufacture for the aforementioned real-world commercial applications.

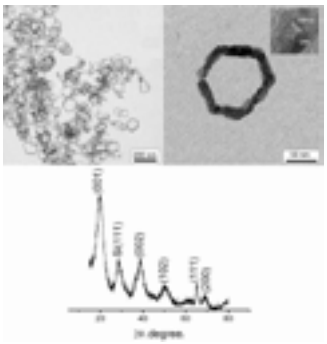

Figure 1: As-prepared Co(OH)2 NPs: up) TEM micrograph of different magnifications, down) XRD pattern.

Biography

Masih Darbandi received his PhD in 2007 from Freiburg University, Germany, where he worked on semiconductor nanoparticles (QDs). Thereafter, he spent several years as a Postdoctoral Scientist in Bochum, Duisburg-Essen (Germany) and Uppsala (Sweden) universities working on different topics from MOF to Magnetic Nanoparticles. In 2012, he moved to USA as Senior Scientist (Staff) working at Vanderbilt and Brown Universities. His research area was ceramic nanoparticles, fabrication and the characterization of freestanding films of ceramic nanoparticles via electrophoretic deposition. Right now he holds a position as Faculty Member in University of Tabriz, Iran.

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