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Synthesis of NiO nanoparticles for new nanocomposite materials

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Nanostructured oxides are gaining continuous importance for various applications due to their unique physical and chemical properties based on the size-homogeneity and large specific surface area. Crystallography and size of the nano-materials greatly affect their applications in designing optical, electronic, magnetic and catalytic materials. NiO is an important inorganic oxide extensively used in catalysis, battery cathodes, electrochromic films, and magnetic materials. Nanocrystalline NiO is believed to have many better properties than those of micrometer-sized NiO particles in terms of the volume effect, the quantum size effect, the surface effect. The present work represents an attempt to synthesize of suitable NiO-nanoparticle for the design of high performance novel nanocomposite materials. The effect of synthesis conditions on morphology development and surface area was experimentally investigated. Nano-NiO particles have been obtained by thermal decomposition method using NiCl_2 and $\text{NH}_3 \cdot \text{H}_2\text{O}$ as the raw materials. After calcination process of the $\text{Ni}(\text{OH})_2$ precursors at 400-500°C for 1 h, green $\text{Ni}(\text{OH})_2$ precursors have been transformed into black NiO nanoparticles. XRD patterns of NiO nanoparticles confirmed the conversion of $\text{Ni}(\text{OH})_2$ into NiO nanostructure. Nanostructures were also confirmed SEM, TEM, FTIR, Raman and Uv-vis analyses. Analysis results reveal that the synthesized nanoparticles have cubic particles with an average diameter of around 8-13 nm. The NiO nanoparticle obtained at 400°C with the highest surface area and small crystal size has been chosen as a suitable dopant to design new nanocomposite materials.

Biography

Sevil Çetinkaya is a Professor of Inorganic Chemistry in the Department of Chemistry at Kirikkale University. She obtained her PhD in Inorganic Chemistry at Hacettepe University in 2003. She was a TÜBİTAK/Royal Society visiting Research Fellow at Durham University in 2005. She received L'Oréal Turkey for Young Woman in Science Award in 2016. She joined the Kirikkale University as an Assistant Professor in 2006, and became an full Professor in 2013. Her current research interests focused on organometallic chemistry, design, preparation and applications of nanomaterials and porous carbon materials.

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