World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:8, No:06, 2014

Microwave Synthesis, Optical Properties and Surface Area Studies of NiO Nanoparticles

Authors : Ayed S. Al-Shihri, Abul Kalam, Abdullah G. Al-Sehemi, Gaohui Du, Tokeer Ahmad, Ahmad Irfan

Abstract : We report here the synthesis of nickel oxide (NiO) nanoparticles by microwave-assisted method, using a common precipitating agent followed by calcination in air at 400°C. The effect of the microwave and pH on the crystallite size, morphology, structure, energy band gap and surface area of NiO have been investigated by means of powder X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), high resolution transmission electron microscopy (HRTEM), Fourier transform infrared spectroscopy (FTIR), ultraviolet visible spectroscopy (UV-vis) and BET surface area studies. X-ray diffraction studies showed the formation of monophasic and highly crystalline cubic NiO. TEM analysis led to decrease the average grain size of NiO nanoparticles from 16.5 nm to 14 nm on increasing the amount of NaOH. FTIR studies also confirm the formation of NiO nanoparticles. It was observed that on increasing the volume of NaOH, the optical band gap energy (2.85 eV to 2.95 eV) and specific surface area (33.1 to 39.8 m2/g) increases, however the average particles size decreases (16.5 nm to 14 nm). This method may be extended to large scale synthesis of other metal oxides nanoparticles and the present study could be used for the potential applications in water treatment and many other fields.

Keywords : BET surface area analysis, electron microscopy, optical properties, X-ray techniques
Conference Title : ICMSAPC 2014 : International Conference on Materials Science, Applied Physics and Chemistry
Conference Location : London, United Kingdom
Conference Dates : June 29-30, 2014

Open Science Index, Materials and Metallurgical Engineering Vol:8, No:06, 2014 publications.waset.org/abstracts/10258.pdf