Size dependence of optical and magnetic properties of nickel oxide nanoparticles fabricated by electric arc discharge method

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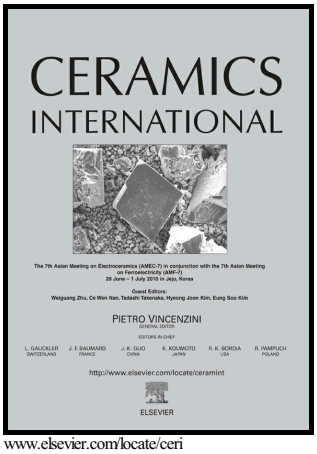

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PII: S0272-8842(17)31512-2
DOI: http://dx.doi.org/10.1016/j.ceramint.2017.07.077
Reference: CERI15797

To appear in: *Ceramics International*

Received date: 25 April 2017
Revised date: 10 July 2017
Accepted date: 11 July 2017

Cite this article as: Mansoor Farbod, Vahid Kargar dehbidi and Morteza Zargar Shoushtari, Size dependence of optical and magnetic properties of nickel oxid nanoparticles fabricated by electric arc discharge method, *Ceramic International,* http://dx.doi.org/10.1016/j.ceramint.2017.07.077

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Abstract

Nickel oxide nanoparticles with an average size of between 28-62 nm were fabricated by electric arc discharge method. The electric currents of 10, 100, 200, 300 and 400 A and oxygen pressures of 1, 2 and 3 atm. were tested. High yield production was observed for the samples prepared at low arc current. The samples were characterized using XRD and FESEM measurements. XRD results showed that the samples were pure and single phase of nickel oxide with cubic structure. The produced nanoparticles were cubic shaped and the average particle sizes increased by increasing the arc pressure, but decreased by increasing the arc current and their size distributions were uniform. The magnetic measurements confirmed a soft ferromagnetic behavior for the nickel oxide nanoparticles at low field region but the hysteresis loop tended to be antiferromagnetic like for the higher fields. By decreasing the particle size from 62 nm, the coercivity (H_c) increased but decreased when the particle size was less than about 57 nm. Such magnetic behavior which can be common for antiferromagnetic nanoparticles was interpreted based on a core-shell model.

Keywords: C. Optical properties; C. Magnetic properties; D. Transition metal oxides; Arc discharge

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