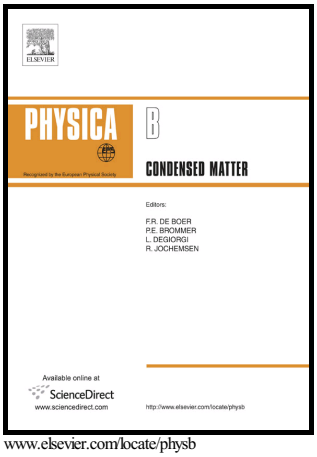
The effect of saturation magnetization of nanocatalyst and oscillating magnetic field for green urea synthesis

Noorhana Yahya, Bilal Alqasem, Muhammad Irfan, Saima Qureshi, Zia Ur Rehman, Afza Shafie, Hassan Soleimani



www.elsevier.com/locate/physb

PII: S0921-4526(16)30555-5
DOI: http://dx.doi.org/10.1016/j.physb.2016.11.024
Reference: PHYSB309728

To appear in: *Physica B: Physics of Condensed Matter*

Received date: 5 October 2016
Revised date: 13 October 2016
Accepted date: 20 November 2016

Cite this article as: Noorhana Yahya, Bilal Alqasem, Muhammad Irfan, Saima Qureshi, Zia Ur Rehman, Afza Shafie and Hassan Soleimani, The effect of saturation magnetization of nanocatalyst and oscillating magnetic field for green urea synthesis, *Physica B: Physics of Condensed Matter* http://dx.doi.org/10.1016/j.physb.2016.11.024

The effect of saturation magnetization of nanocatalyst and oscillating magnetic field for green urea synthesis

Noorhana Yahya[a,*], Bilal Alqasem[a], Muhammad Irfan[a], Saima Qureshi[a], Zia Ur Rehman[a], Afza Shafie[a], Hassan Soleimani[a]

[a] *Fundamental and Applied Sciences Department,Universiti Teknologi PETRONAS, 32610 Seri Iskandar,Perak, Malaysia*

Abstract

Hematite and cupric oxide nanowires have been synthesized using the oxidation method for green urea production. Hematite nanowires were obtained by the oxidation of an iron wire at a temperature of 650 °C and ambient pressure in the presence of N_2 and O_2 gases. Cupric oxide nanowires were obtained by the same method at 700 °C, using a copper wire. The X-ray diffraction results show the formation of rhombohedral structure of $\alpha-Fe_2O_3$ and monoclinic phase of CuO. FE-SEM results reveal the formation of nanowires with dimensions ranging between 5-15 μm, 4-12 μm in length and a diametere ranging between 50-150 nm and 50-250 nm for $\alpha-Fe_2O_3$ and CuO respectively. The VSM results show that the saturation magnetization values for hematite and cupric oxide were 132.8700 and 0.0124 emu/g, respectively. The nanowires were used as catalyst for green urea synthesis in the presence of an oscillating and a static magnetic fields. The use of nanocatalyst with high saturation magnetization gives a higher yield of urea due to the increase in the singlet to triplet conversion. The highest yield of urea 11243 ppm was achieved by applying an oscillating magnetic field of frequency 0.5 MHz and using $\alpha-Fe_2O_3$ nanowires as nanocatalyst.

Keywords: $\alpha-Fe_2O_3$, nanowires, nanocatalyst, singlet to triplet conversion, green urea, oscillating magnetic field

*Corresponding author

Email addresses: noorhana_yahya@petronas.com.my (Noorhana Yahya), bilalalqasem@yahoo.com (Bilal Alqasem)