International Journal of ChemTech Research
CODEN (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.11 No.10, pp 33-40, 2018

Activated carbon-doped with iron oxide nanoparticles (α-Fe_2O_3 NPs) preparation: particle size, shape, and impurity

Settakorn Upasen

Department of Chemical Engineering, Faculty of Engineering, Burapha University, 169 Long-Hard Bangsaen Road, Saensook District, Muang, Chonburi, 20131 Thailand

Abstract : Inspired by the development of an adsorbent material with a high capacity for chlorinated gas treatment, an α-Fe_2O_3 nanoparticle deposited activated carbon adsorbent was successfully synthesized. The α-Fe_2O_3 NPs synthesis was done by a facile chemical precipitation method using sodium hydroxide (NaOH) as a precipitant agent. The variation of the molar ratio of the reactant and precipitant (i.e. 1:1, 1:1.5, 1:2 by mole) and of the precipitating temperature (i.e. 50, 70, 90°C) were explored. The physical and chemical characteristics of the synthesized samples were examined using various techniques; Transmission Electron Microscope (TEM), Brunauer-Emmett-Teller analysis (BET), Thermogravimetry analysis (TGA), Fourier Transform Infra-Red (FT-IR) and Ultraviolet-Visible spectrophotometer. The result shows that two synthesized conditions - 1:1 by mole ($FeCl_3$:NaOH) at 70°C and 1:1.5 by mole ($FeCl_3$:NaOH) at 90°C -were allowed to produce the smallest size of α-Fe_2O_3 NPs approximately 10 nm. Consequently, it gave the highest specific surface area of ~110 m^2/g. With a higher $FeCl_3$: NaOH molar ratio and a higher precipitating temperature, the synthesized Fe_2O_3 NPs formed a more oval shape with a finer surface. Due to the insufficient purification, unfortunately, an impurity caused by sodium salt was detected in the amount of 5-10 wt.%. The minimum amount of 75 wt.% α-Fe_2O_3 NPs coated on the activated carbon was observed. The production yield of the synthesized α-Fe_2O_3 and α-Fe_2O_3/GAC samples was also reported.

Keywords : Iron oxide (α-Fe_2O_3), nanoparticle, activated carbon, synthesis, characterization.

Settakorn Upasen /International Journal of ChemTech Research, 2018,11(10): 33-40.

DOI= http://dx.doi.org/10.20902/IJCTR.2018.111006

*****