AN INNOVATIVE APPROACH TO PRODUCE SPHERICAL AND SQUARE-LIKE IRON OXIDES NANOPARTICLES IN THE LABORATORY FROM SRI LANKAN FERRUGINOUS LATERITE

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Sri Lanka is rich in laterite deposits with large mineable quantities that are mainly composed of goethite, haematite, magnetite, dickite, gibbsite and quartz as major minerals and minor amounts of accessory minerals like ilmenite and or rutile. However, currently laterites are not used for any industry, except they were used as bricks until recent past. The present study aims to produce value added products including nanomaterials by novel techniques using ferruginous laterite as a raw material for wide range of applications. Laterite samples were collected from Homagama, Sri Lanka and on determining their chemical compositions by X-ray diffractrometry (XRD) were found to contain goethite, haematite, dickite, gibbsite, and quartz as major minerals. The rock sample was washed, dried, ground to a fine powder approximately below 250 μm particle size and reacted with excess HCl under boiling temperatures. The supernatant (S-1) and the residue were separated. S-1 composed of almost all the iron ions and some negligible amount of alumina It was mixed with sodium dodecyl sulphate and iron hydroxide nanoparticles were precipitated from the supernatant by adding it to a NaOH solution dropwise until the pH reached 14. The mixture was heated to 80°C in order to make sure that Al ions remained in the solution as AlO_2^{1-}. Then prepared nanoparticles were washed several times with distilled water and calcined at 600°C for 1h, to convert into iron oxide nanoparticles. Scanning electron microscopy (SEM) of final product showed that the iron oxide particles are in spherical morphology with particle size range of 30-100 nm. To produce square shaped nanoparticles, S-1 was added dropwise into a NaOH solution under direct sonication. Then the wet precipitate was added into ethanol under normal laboratory (nonultrasonic) conditions followed by stirring. Finally the precipitate was separated by centrifuging and dried at 40°C. The precipitate was calcined at 600°C for 1h. SEM confirms that the particles are in square morphology in size range of 50-100 nm.

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