Removal of Mercury from Dental Wastewater

N.K.D.S. Abeysiri, K.A.M.M. Kumarasinghe, and Asha S. Galhenage

Industrial waste, especially heavy metals such as mercury, have generated a significant threat to public health due to their toxicity and persistence in the environment. These effluents should be treated well before releasing to the environment. Mercury is one of the unceasing pollutants in dental wastewater. Iron Oxide nanoparticles (IONPs) (specifically the magnetite (Fe_3O_4) and magnemite(γ- Fe_3O_4) show excellent magnetic properties facilitate the removal of heavy metals from aqueous system. Iron oxide nanoparticles are receiving much attention due to their properties, such as low manufacturing cost, physical and chemical stability, environmental safety, great biocompatibility, ease of separation, high surface-area to volume ratio, surface modifiability, reusability, and excellent magnetic properties. In this study, Fe_3O_4 was used to adsorb mercury in dental waste water and it was synthesized by co-precipitation method using iron salts and NaOH as precipitation agents, and aloe vera as stabilizing agent. T he resulted Fe_3O_4 was transformed into γ- Fe_3O_4 nanoparticles. Synthesized nanoparticles were characterized by three different measurements: first, using a particle size analysis to find the particle size distribution, secondly FTIR analysis to ensure the formation of Fe_3O_4, and finally XRD analysis to ensure the formation of required phase of iron oxide. The results of this characterization confirm that the obtained iron oxides nanoparticles have a wide size distribution ($\sim$100nm). Atomic absorption spectroscopy measurements reveals about 70% of mercury contaminated with dental wastewater was adsorbed by synthesized γ- Fe_3O_4 nanoparticles.