# VINGNANAM Research Conference

# 21st of July 2022

# VRC–2022

Faculty of Science
University of Jaffna
Sri Lanka

**Jointly Organized by**

**Faculty of Science**
**University of Jaffna**
**Sri Lanka**

**Western Norway University of Applied Sciences**

# Removal of Pb (II) ion using magnetically modified MgO nanoparticles

***V. Gurunanthanan[1]*, D. U. Hettiarachchi[2], H. C. S. Perera[1,3], S. S. Gunathilake[1,4] and B. S. Dassanayake[1,3]***

*[1] Postgraduate Institute of Science, University of Peradeniya, Sri Lanka*

*[2] Department of Physics and Astronomy, University of Mississippi, United States*

*[3] Department of Physics, Faculty of Science, University of Peradeniya, Sri Lanka*

*[4] Department of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka*

** Correspondence: guru201666@gmail.com*

The deterioration of water quality and the presence of lead (Pb), one of the most hazardous heavy metals, have put the health of people all over the world in danger. MgO became popular as an adsorbent in removing Pb in wastewater due to its high adsorption capacity. Immobilizing magnetic nanoparticles inside the adsorbent can be used as an effective way to separate them after the adsorption process. In this study, magnetic MgO nanocomposites were synthesized by a precipitation-calcination method. MgO encompassed Fe and $Fe_3O_4$ nanoparticles were synthesized considering the strong magnetic properties of Fe and $Fe_3O_4$ and the high adsorption capacity of MgO. The X-ray diffraction patterns of synthesized magnetic MgO confirm the presence of MgO and the cubic structure of the metallic phase of Fe and $Fe_3O_4$. Particle morphology and particle size were observed for magnetic MgO and Pb adsorbed magnetic MgO by using SEM images. The observed significant improvement in particle size was mainly due to the formation of magnetic $Mg(OH)_2$ and adsorption of Pb(II) when magnetic MgO nanocomposites were introduced to an aqueous solution containing Pb(II). FTIR analysis on magnetic MgO and Pb(II) adsorbed magnetic MgO confirmed the disappearance of the peak 3648 $cm^{-1}$ and it suggests that MgO might have been covered by PbO initially. The shifted peak at Pb(II) adsorbed magnetic MgO indicates that the adsorption process occurs through the OH groups. Pb(II) concentrations were determined by an atomic absorption spectrometer. The efficiency of Pb(II) adsorption was investigated using the variations in equilibrium adsorption capacity at different initial concentrations and the variations in adsorption capacity over time. Experimental data agrees with the Langmuir isotherm model and the pseudo-second-order model. This suggests a monolayer chemisorption process, and the Langmuir equation provided the adsorption capacity as 1178.6 mg $g^{-1}$.

*Keywords:* *Adsorption, Lead (Pb), Magnetic MgO, Wastewater.*

*Acknowledgment:* *This work was supported by the* Science batch *of 1976-1980 of the University of Peradeniya, Sri Lanka.*