National University of Science and Technology

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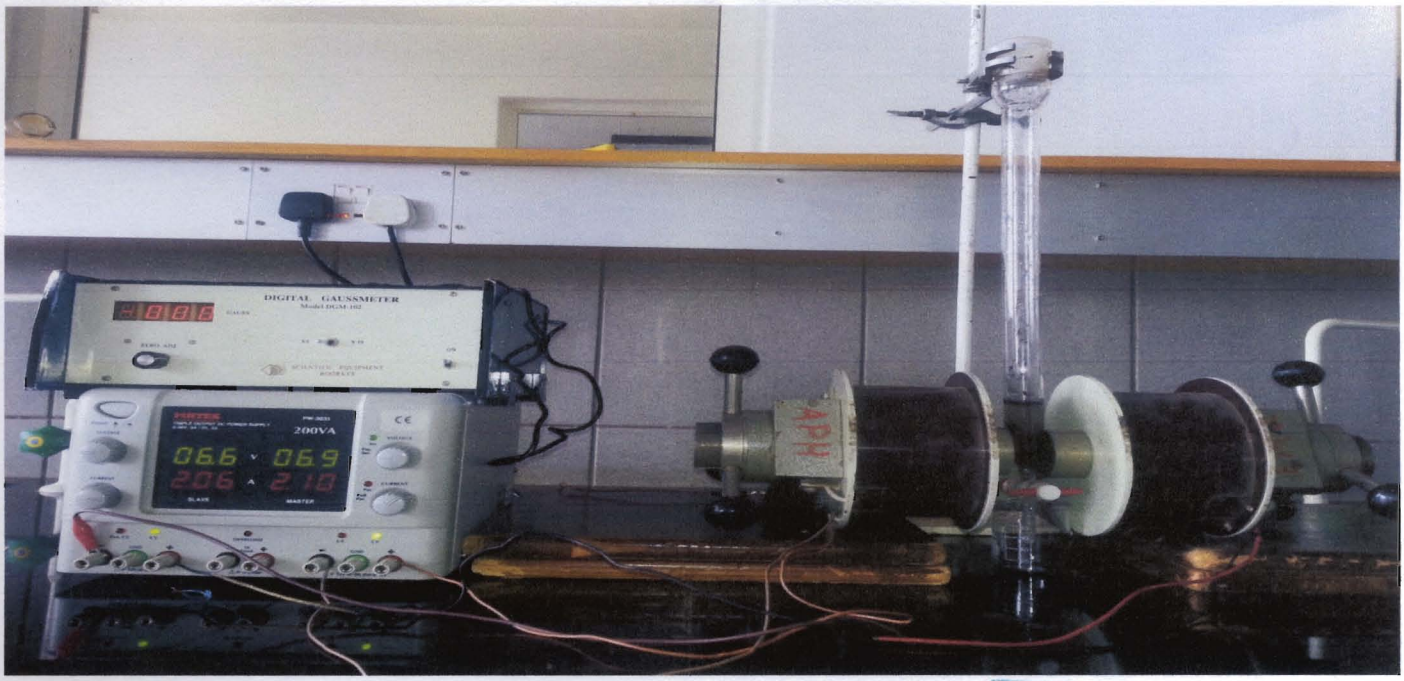
FACULTY OF APPLIED SCIENCES

APPLIED CHEMISTRY DEPARTMENT

PROJECT TITLE

Investigating the enhancement of the adsorption capabilities of magnetite by an external magnetic field in Hexavalent Chromium removal from contaminated water.



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ABSTRACT

This work examined the removal of Cr (VI) using magnetite assisted by an electromagnetic field. These magnetic nanoparticles can be used to adsorb heavy metal ion (HMI) contaminants in wastewater. It was found that the pH and concentration of the HMI solution, agitation, adsorbent dosage, particle size and contact time affected the degree of adsorption. The adsorption capabilities were subsequently enhanced by the use of an external magnetic field. The magnetite nanoparticles were synthesized according to patent ZPO 21/2010. Batch experiments were carried out to investigate the adsorption of hexavalent chromium onto magnetic nanoparticles. The adsorption equilibrium was attained with a 45 minute contact time. The equilibrium adsorption isotherms were evaluated using Langmuir and Freundlich models. The adsorption isotherm fitted well to both isotherms with maximum adsorption capacity of 0.147 mg g-1. The adsorption was between 32.7% and 97.8% under conditions studied. The results showed that the nanoparticles in the presence of an external magnetic field, generated by an optimum current of 2.5A, have the highest adsorption capacity for Cr (VI) ions per unit magnetite weight.