

# MODIFIED CLAYS FOR TEXTILE DYES AND RARE EARTH ELEMENTS SORPTION AND POTENTIAL RECOVERY

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## **Abstract**

Textile manufacturing as well as waste management are core sectors which discharge heavy loads of contaminants which are toxic and potentially carcinogenic, thus affecting aquatic biota and human health. As a result, the ineffective treatment of wastewater from manufacturing and leachate from industrial/municipal solid waste landfills not only causes environmental concerns but also lost potential secondary resources. The research aims to evaluate the removal efficiency and the recovery potential of textile dye and rare earth elements (REE's) from aqueous solutions using modified clays. Lanthanum (La), Cerium (Ce (III)) and Neodymium (Nd) have been selected as representatives of REE's while Congo Red (CR) has been chosen as the toxic and suspected carcinogen and mutagen textile dye. The chosen sorbents were smectite type clays modified with imidazolium based ionic liquids (IL) and hydroxyapatite (HAp). The properties of the modified clays were studied using X-ray diffraction, scanning electron microscopy, Fourier transform infrared spectroscopy and thermogravimetric technique. The sorption of CR and La, Ce (III), Nd from aqueous solutions onto the IL and HAp modified clays was studied using batch sorption experiments. The maximum sorption capacity of CR onto the IL modified clays was 150 mg/g; but maximum sorption of La, Ce (III) and Nd onto HAp modified clays was found to be 247 mg/g, 252 mg/g and 255 mg/g respectively. The results showed that CR and La, Ce (III), Nd ions can be efficiently removed from aqueous solutions by modified clays and the dye and REE's can be potentially recovered; furthermore, modified clays can be recycled and reused.

**Keywords:** Congo Red, Lanthanum, Cerium (III), Neodymium, Modification, Clays, Sorption, Recovery, Wastewater Treatment