

## **Coagulation/Flocculation of lignin aqueous solution in single stage mixing tank system: Modeling and optimization by response surface methodology**

### **Abstract**

Lignin particles contribute to color pollution in river water and treating this type of pollution biologically is difficult. In this study, the treatment of a model solution containing lignin using a single mixing tank system approach with poly-diallyldimethyl ammonium chloride (polyDADMAC) as destabilizer was carried out. The effect of various flocculants i.e., calcium lactate, magnesium hydroxide and anionic polyacrylamide (APAM) were investigated. Calcium lactate performed better than magnesium hydroxide and anionic polyacrylamide as flocculants. The coagulation/flocculation with polyDADMAC–calcium lactate removed lignin through a complex mechanism: the adsorptive-charge neutralization–precipitation–bridging mechanism. Response surface methodology (RSM) study indicated that strong interaction in the coagulation/flocculation of lignin occurred between the initial pH–polyDADMAC dosage, initial pH–calcium lactate dosage and polyDADMAC–calcium lactate dosage. The highest lignin removal achieved was between 50 and 68%. The removal behavior depended on the initial lignin concentration in the solution. The results showed that lignin removal from aqueous solution is possible in a single stage mixing tank by utilizing polyDADMAC–calcium lactate as a dual coagulant. The method mentioned here will potentially be useful for the treatment of lignin containing wastewater from several industrial processes such as palm oil mill, pulp and paper, olive mill etc.