

**REMOVAL OF HARDNESS FROM DRINKING WATER  
USING MONTMORILLONITE CLAY MATERIAL**

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## ABSTRACT

Hard water contains mainly calcium ions. It consumes soap before lather will form, deposits soap curd on bath tubs, and forms scale in boilers, water heaters, and pipes. This paper deals with the use of Montmorillonite clay in water softening application, which was done in both batch modes. Montmorillonite is a smectite clay based on bi-dimensional lamellar aluminosilicate structure leading to a naturally high surface area/volume ratio. The interlayer spacing, pore diameter and also particle size of Montmorillonite can be modified in the level of nano-scale. It is additionally expansive in liquid and cation exchangeable. The batch experimental results informed that the hardness removal by Montmorillonite is possible. Calcium was removed from hard water by ion-exchange mechanism with the natural exchangeable cations, such as sodium and potassium ions, located between the Montmorillonite layers. The present study focuses on Calcium(Ca) and Magnesium(Mg) removal by adsorption using particle size within the range of 250 $\mu$ m-125 $\mu$ m without pretreatment or activation. The optimum agitation time and optimum pH were 5.5 and 60 minutes respectively for Calcium ion and 5 and 60 minutes for Magnesium ion. The removal followed the Langmuir isotherm with  $R^2 = 0.957$ .

Key Words: Adsorption, calcium, Magnesium, Montmorillonite