**Efficient modification of montmorillonite with Sodium Lignosulfonate to adsorb Cd2+.**

Jianzhe Ma1

*1 School of Chemical Engineering, Nanjing University of Science and Technology, Nanjing 210094, Jiangsu, China.*

*\*Corresponding author: 748447353@qq.com*

**Highlights**

* Preparation of the modified Na montmorillonite with sodium
* Lignosulphonate-montmorillonite composites increase the heavy metal retention.
* The key parameters that control the chelation are determined.

**1. Introduction**

The remediation of wastewater containing Cd2+ has attracted much attention due to the harm of Cd2+ to the environment and human health[1]. Montmorillonite could be a kind of potential low cost sorbent for various kinds of heavy metals since it is abundant in nature and only needs little processing[2].In spite of the huge amounts of papers reporting the use of untreated clay minerals for the heavy metal retention, the cation exchange capacity is not enough for large-scale applications. In order to increase the selectivity and the adsorption capacity for heavy metal cations, a promising adsorbent, functionalized montmorillonite modified with sodium lignosulphonate (Na-LS) was prepared under mild reaction conditions.

**2. Methods**

The Na-LS modified Ca-montmorillonite (denoted as NA-LS-MMT) was synthesized by mixing 5.00 g of Ca-MMT and 1.00 g of Na-LS in a 250-mL glass bottle. Then, the pH of the mixture of Na-LS and Ca-MMT suspension was adjusted to 5.0 using 1.0 M NaOH and 1.0 M HNO3 solutions. Afterwards, the suspension was shaken in a water bath shaker at 25 °C for 20 h. Subsequently, the resulting material was collected by centrifugation at 4000 rpm for 10 min, washed out the excess of Na-LS on the surface of Ca-MMT with deionized water for several times, so as to remove excess HA. Finally, the precipitate was air-dried at 45 °C, pulverized to pass through a 200-mesh sieve, and stored for future use.

**3. Results and discussion**

The batch adsorption experiments illustrated that the removal capacity of Cd2+ was crucially dependent on pH and the initial concentration of solution and it was favorable with an increase in pH in acidic solution. The adsorption thermodynamics of Cd2+ by NA-LS-MMT showed that the adsorption process was an endothermic reaction. The adsorption kinetics of NA-LS-MMT showed a better fit with the pseudo-second-order model. The adsorption isotherm data of NA-LS-MMT followed the Freundlich isotherm better, which inferred that more than one kind of adsorption site happened on NA-LS-MMT (ion exchange and chelation).

**4. Conclusions**

In conclusion, composite adsorptive materials based on lignosulphonate and montmorillonite have been successfully prepared and characterized in depth. The raw montmorillonite and the composites were tested for heavy metal retention. The experimental results indicate the capacity of our composites to chelate heavy metal cations. Indeed, a high affinity between the lignosulphonate and all heavy metal cations was observed.

**References**

[1] Xueyan, G., Z. Shuzhen, and S. Xiao-quan, J. Hazard. Mater. 2008. **151**(1): p. 134-142.

[2] Abollino, O., et al*.* Water Res. 2003. **37**(7): p. 1619-1627.