

## Adsorption behavior of perchlorate removal from aqueous solution using MgAlCe hydrotalcite-like compounds

Yiqiong Yang<sup>a</sup>, Dewei Wen<sup>a</sup>, Qiao Ding<sup>a</sup>, Yin Wang<sup>a</sup>, Ning Liu<sup>a</sup>, Yunxiao Zhao<sup>b,\*</sup>, Xiaodong Zhang<sup>a,\*</sup>

<sup>a</sup>School of Environment and Architecture, University of Shanghai for Science and Technology, Shanghai 200093, China, email: yangyiqiong@usst.edu.cn (Y. Yang), 253751902@qq.com (D. Wen), 2389471213@qq.com (Q. Ding), 625xiaogui@163.com (Y. Wang), liuning6910@163.com (N. Liu), Tel. +86 15921267160, Fax. +86 021 55275979, email: fatzhd@126.com (X. Zhang)

<sup>b</sup>Shanghai SINAP Membrane Tech Co., Ltd., Shanghai, 200942, China, email: yunxiao\_zhao@163.com (Y. Zhao)

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### ABSTRACT

A series of MgAlCe hydrotalcite-like compounds (HMAC) with different Mg/Al/Ce ratios were prepared via co-precipitation method, and their calcination products (CHMAC) were used as an adsorbent to remove perchlorate anionic pollutant from aqueous solution. The HMAC, CHMAC and reconstructed CHMAC were characterized by XRD, FT-IR spectra, TG and DTA. The characterization results displayed that the layered double hydroxides structures in the HMAC were lost during calcination at 600°C, but were reconstructed subsequent to adsorption of perchlorate, which was primary driven by the “reformation effect” of HMAC with perchlorate as an interlayer anion. Batch adsorption studies were performed, and the reactivity and mechanism were discussed regarding the effect of various equilibration conditions, such as adsorbent dosage, initial solution pH, initial perchlorate concentration, co-existing anions, temperature and contact time. It was found that the existence of Ce<sup>3+</sup> in CHMAC was favorable to removal of perchlorate from water, and the best ratio of Mg/Al/Ce is 3:0.8:0.2 (CHMAFC). The equilibrium adsorption data fitted well to the Freundlich model and the experimental data revealed a good compliance with the pseudo-first-order kinetic model. Thermodynamic parameters ( $\Delta G^\circ$ ,  $\Delta H^\circ$  and  $\Delta S^\circ$ ) indicated that the adsorption process was endothermic and spontaneous in nature. The calcination product of MgAlCe hydrotalcite-like compound was a promising adsorbent for perchlorate anionic pollutant.

*Keywords:* MgAlCe hydrotalcite-like compounds; Adsorption; Calcination; Perchlorate

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\*Corresponding author.