

Supporting Information

Preparation of CaMgAl-LDHs and mesoporous silica sorbents derived from blast furnace slag for CO₂ capture

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Figures:

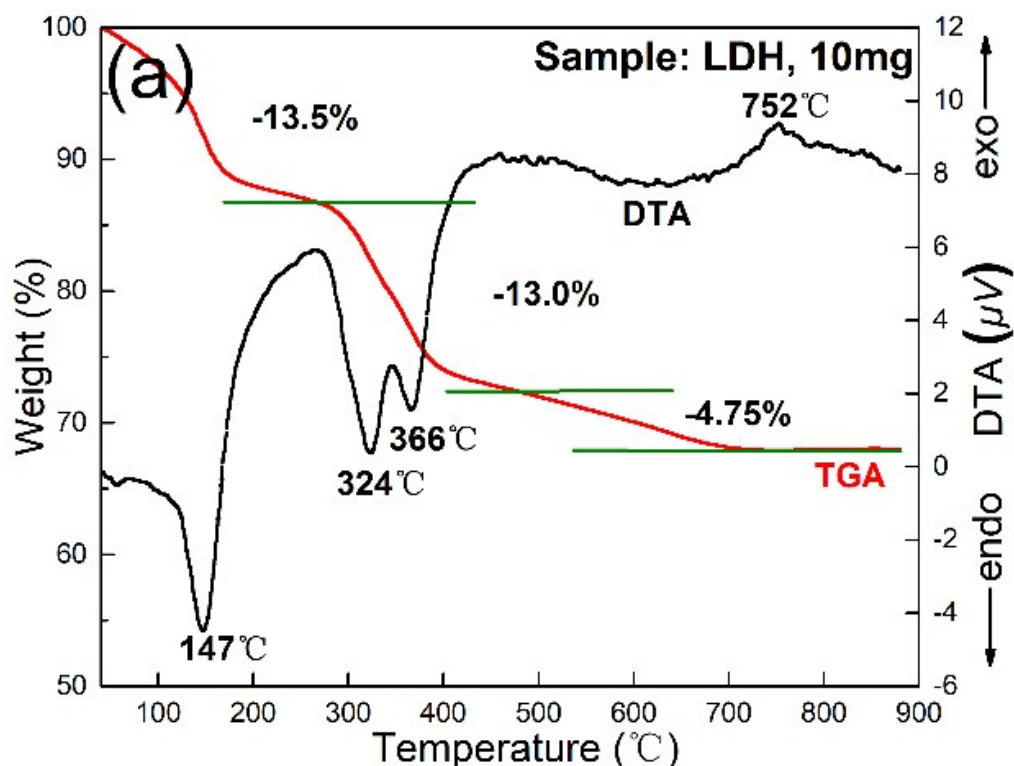


Fig.S1 TGA and DTA profiles of LDHs

Analysis: The thermal degradation events of as-prepared LDHs material from BF slag were further studied by TGA in N_2 atmosphere as shown in Figure S1. For the thermal decomposition of the Ca-Mg-Al LDHs, three distinct weight loss steps are observed. The first step from room temperature to approximately 250°C corresponds to the removal of the surface-adsorbed water and the interlayer water molecules, with 13.5% weight loss. The second weight loss step in the temperature range from 250 to 480°C is due to the dehydroxylation of the brucite-like layers. In this transition region, the appearance of two endothermic reflections at 324°C , 366°C are likely assignable to the dehydroxylation of Ca-Al LDH and that of Mg-Al LDH, respectively. The third weight loss step in the temperature range from 480 to 700°C is due to the decomposition of intercalated anions, most likely are Cl^- and a small amount of CO_3^{2-} considering the experimental condition. An additional exothermic reflection around 750°C is observed, this can be ascribed to the transition from Ca(Al)-O mixed oxide into CaO and mayenite ($\text{Ca}_{12}\text{Al}_{14}\text{O}_{33}$).

Tables

Table S1 Chemical composition analysis of CaMgAl-LDHs and CaMgAl-LDHs-400 derived from BFS

Sample	Content of elements(wt%)			
	Ca ^A	Mg ^A	Al ^A	Cl ^B
CaMgAl-LDHs	22.14	6.28	7.90	8.69
CaMgAl-LDHs-400	38.25	11.75	13.56	2.11

^A Determined by ICP-OES analysis.

^B Determined by ion chromatography.

Analysis: The chemical composition of CaMgAl-LDHs and CaMgAl-LDHs-400 were listed in Table 1. The content of Ca²⁺, Mg²⁺, Al³⁺ and Cl⁻ were analyzed by ICP-OES technique and Ion chromatography, respectively. Based on the molar ratio of Ca²⁺, Mg²⁺, Al³⁺ and Cl⁻, and the corresponding charge balance, the CaMgAl-LDHs can be expressed by Ca_{1.89}Mg_{0.89}Al_{1.0}(OH)_{7.5}Cl_{0.83}(CO₃)_{0.11}·yH₂O. The CaMgAl-LDHs-400 materials after 4 hrs of calcination still contain a small amount of chloride, and can be expressed as Ca_{1.91}Mg_{0.98}Al_{1.0}Cl_{0.12}O₄.