One-step synthesis of aluminum magnesium oxide nanocomposites for simultaneous removal of arsenic and lead ions in water

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Experimental

Synthesis of aluminum magnesium oxide nanocomposites: All the materials were used as received from Beijing Chemicals Co. (Beijing, China). In a typical synthesis, $Al(NO_3)_3 \cdot 9H_2O$, $Mg(NO_3)_2 \cdot 6H_2O$ (total metal molar is 10 mmol) and 20 mmol of urea were dissolved in 100 mL of anhydrous ethanol under sonication, and then about 40 mL of reaction solution was poured into a Teflon-lined autoclave with a volume of 70 mL. The autoclave was sealed and placed in a programmable microwave oven (MDS-6, Shanghai Sineo microwave Chemistry Technology Co., Ltd.). The oven was heated to 150 °C in 2 min by microwave irradiation, and then kept at that temperature for additional 30 min under microwave heating. After cooling to room temperature, precipitates were collected by centrifugation, washed with water and ethanol, and then dried at 80 °C for 5 h.

Characterizations: X-ray diffraction (XRD) patterns were preformed on a Rigaku D/max-2500 diffractometer with Cu K_α radiation (λ = 0.15418 nm) at 40 kV and 200 mA. The morphologies were characterized by field emission scanning electron microscopy (FE-SEM, JEOL-6701F) and transmission electron microscopy (TEM, JEOL-1011). Nitrogen adsorption−desorption isotherms were measured on a Quantachrome Autosorb AS-1 instrument.

Heavy Metal Ions Adsorption: Solutions with different concentrations of As (V) and Pb (II) were prepared using $Na_2HAsO_4 \cdot 7H_2O$ (98%, Alfa) and $Pb(NO_3)_2$ as the sources of heavy metal ions, respectively. The pH value was adjusted to 6~7 using HCl (2 M). For the adsorption isothermal study, 10 mg of adsorbent was added to 20 mL of solution with different concentrations under stirring for 12 h at room temperature. After that, the solid and liquid were separated and analyzed by inductively coupled plasma−optical emission spectroscopy (Shimazu ICPE-9000) to measure the concentration of metal ions in the remaining solution.

Figures

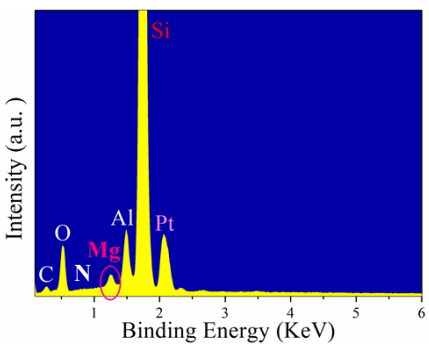

Fig. S1 EDS spectrum of alunimum magnesium oxide nanocomposites obtained at 30 min.

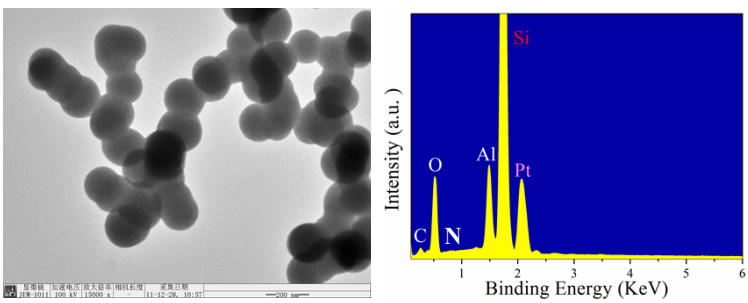

Fig. S2 TEM image and EDS spectrum of alunimum magnesium oxide nanocomposites obtained at 5 min.

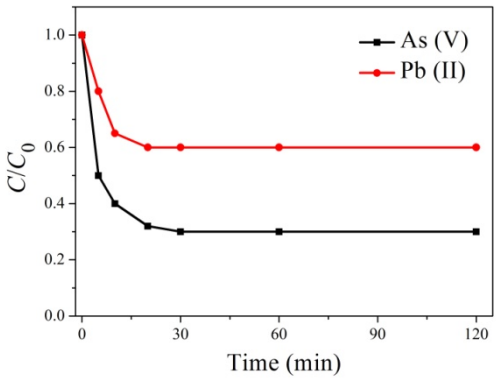

Fig. S3 Adsorption rates of alunimum magnesium oxide nanocomposites (Al_8Mg_2) for As (V) and Pb (II) with initial concentration of 50 mg L^{-1}.