Electronic Supplementary Information

Novel biomolecule-assisted interlayer anion-controlled layered double hydroxide as an efficient sorbent for arsenate removal

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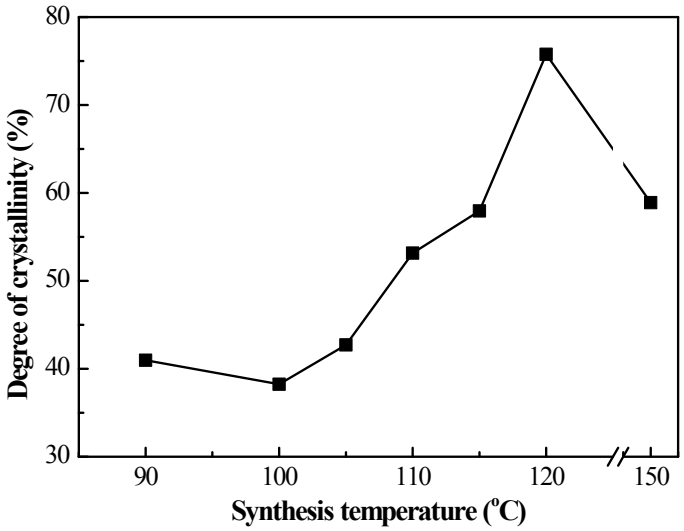


Fig. S1. Change in the degree of crystallinity of MgAl-LDHs with synthesis temperature.

The degree of crystallinity was calculated by the addition of 20 wt.% SiO_2 by the internal standard method. The phase fraction of each component was calculated from the PXRD patterns highest intensity peak area of SiO_2 and LDH phases as shown in the following equation:[1]

$$Phase\ fraction\ of\ LDH\ (F_{LDH}) = \frac{Area\ of\ LDH_{(100\%\ intensity\ peak)}}{(Area\ of\ LDH_{(100\%\ intensity\ peak)} + Area\ of\ standard_{(100\%\ intensity\ peak)})}$$

(i)

The degree of crystallinity of the samples were calculated by the following equation:[2]

$$Degree\ of\ Crystallinity\ (\%) = F_{LDH}\ X\ \frac{F_{S\ (actual)}}{F_S}\left(\frac{1}{1 - F_{S\ (actual)}}\right) X\ 100$$

(ii)

Where, F_{LDH} and F_s are the phase fraction of LDH and standard respectively, and $F_{s\ (actual)}$ is the originally added fraction of internal standard.

References

1. M. H. A. Rahaman, M. U. Khandaker, Z. R. Khan, M. Z. Kufian, I. S. Noor and A. K. Arof, *Phys. Chem. Chem. Phys.*, 2014, **16**, 11527-11537.
2. R. Snellings, L. Machiels, G. Mertens and J. Elsen, *Geologica Belgica*, 2010, **13**, 183-196.

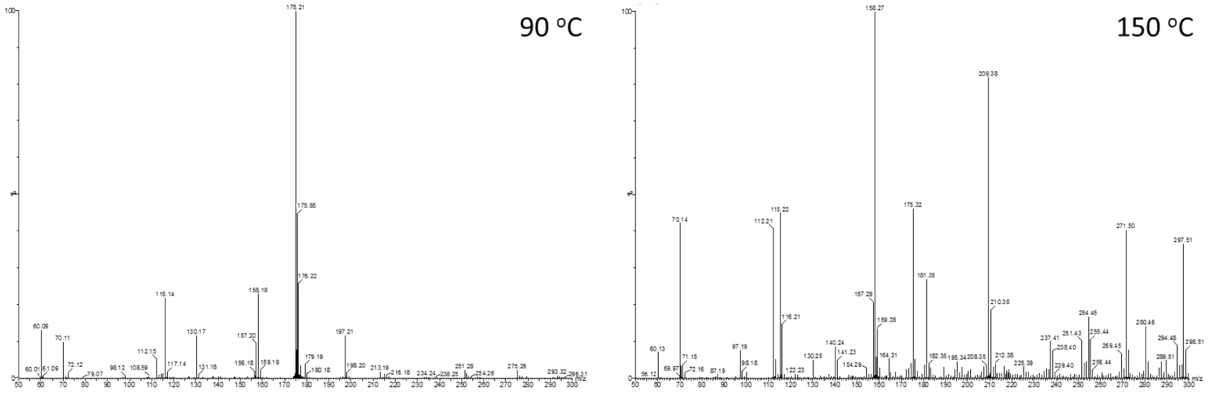
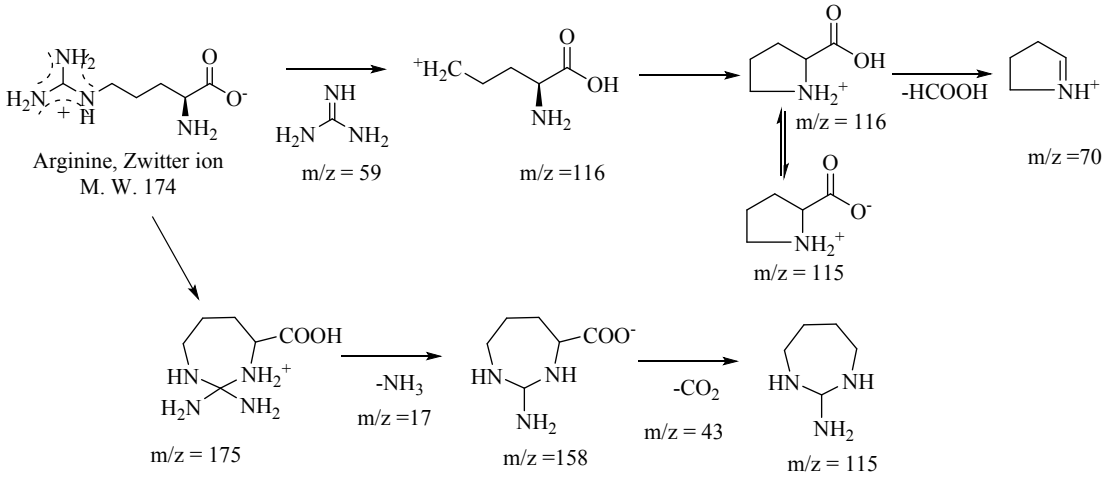


Fig. S2 LC-MS spectra of supernatants obtained after LDH synthesis at different temperatures.



Scheme S1. Thermal decomposition of amino acid during hydrothermal treatment at higher temperatures.[1]

Reference

1. J. J. Zwinselman, N. M. M. Nibbering, J. van der Greef and M. C. T. N. De Brauw, *Org. Mass Spectrom.*, 1983, **18**, 525-529.

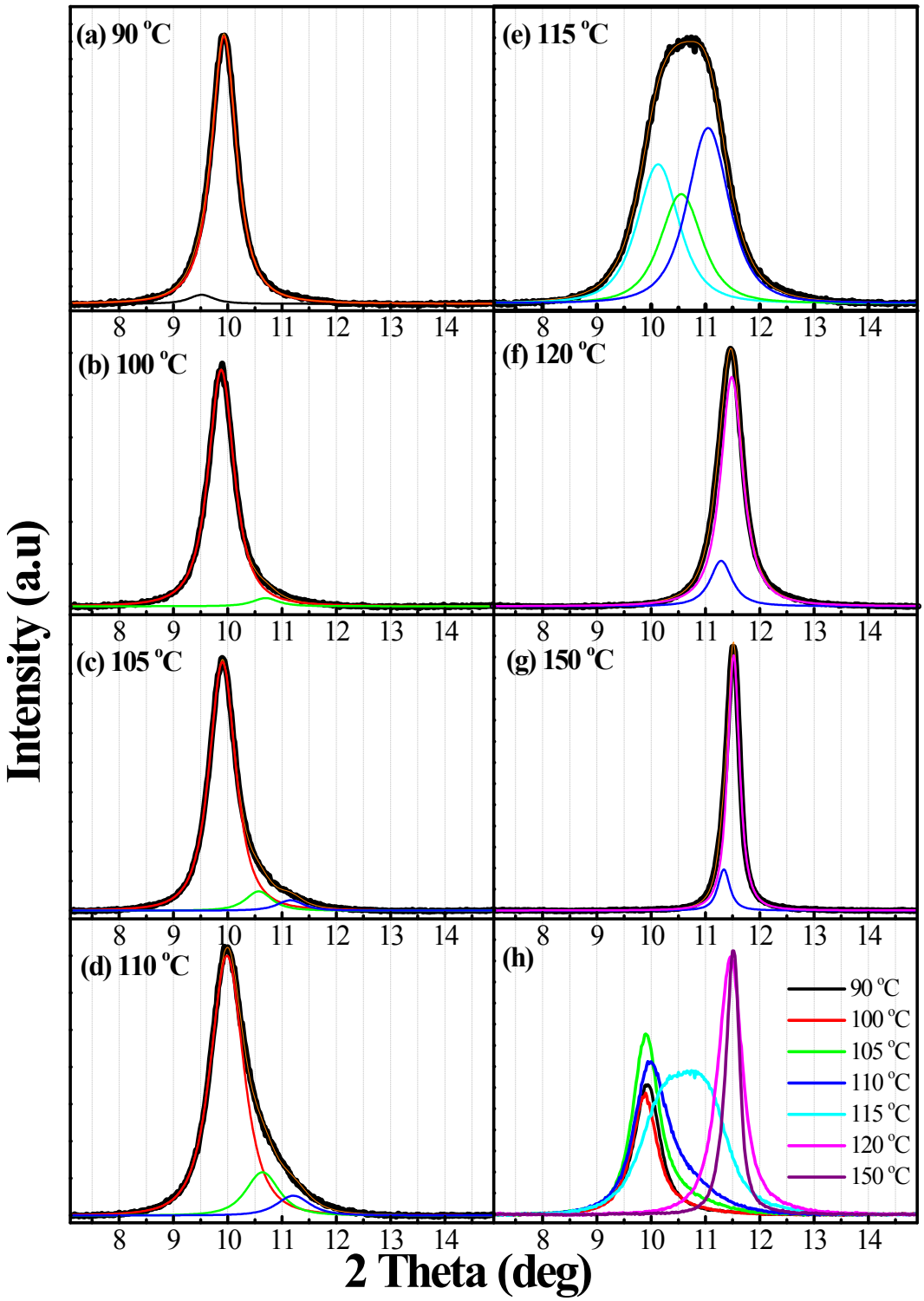

(a) 90 °C
(b) 100 °C
(c) 105 °C
(d) 110 °C
(e) 115 °C
(f) 120 °C
(g) 150 °C
(h)
90 °C
100 °C
105 °C
110 °C
115 °C
120 °C
150 °C
Intensity (a.u)
2 Theta (deg)
8 9 10 11 12 13 14

Fig. S3 PXRD peak fitting of MgAl LDHs synthesized at various temperatures (a-g) and (h) all of the LDHs.

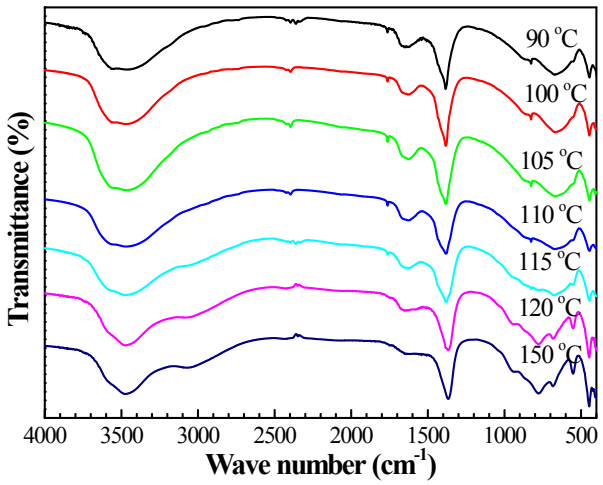


Fig. S4 FT-IR spectra of MgAl-LDHs synthesized at various temperatures.

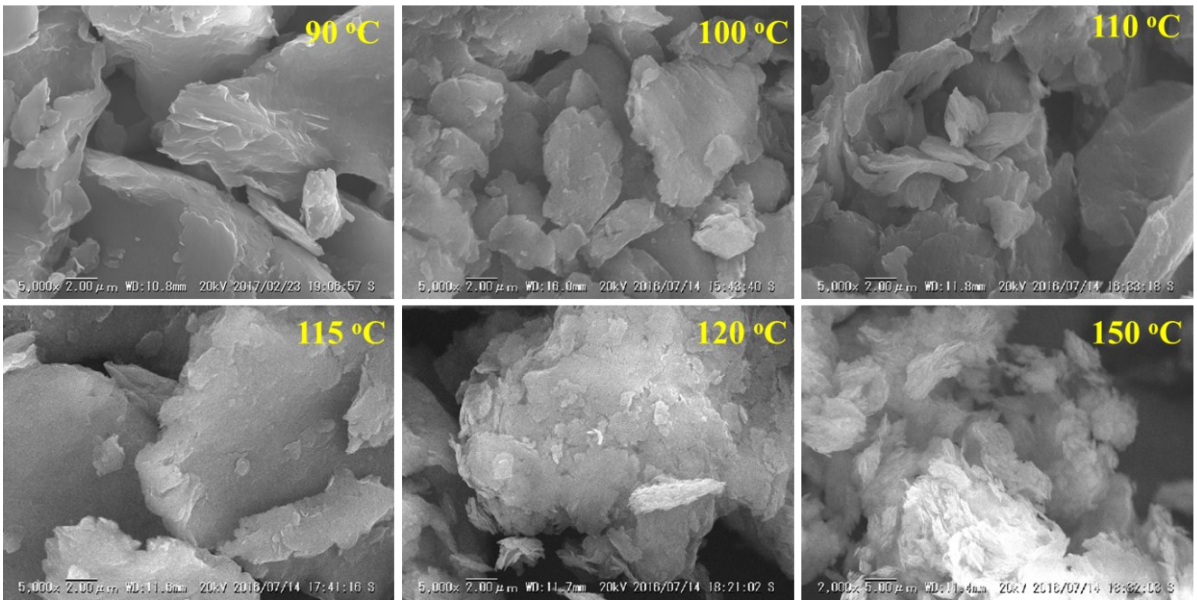


Fig. S5 SEM images of MgAl-LDHs synthesized at various temperatures (scale bar = 2 µm).

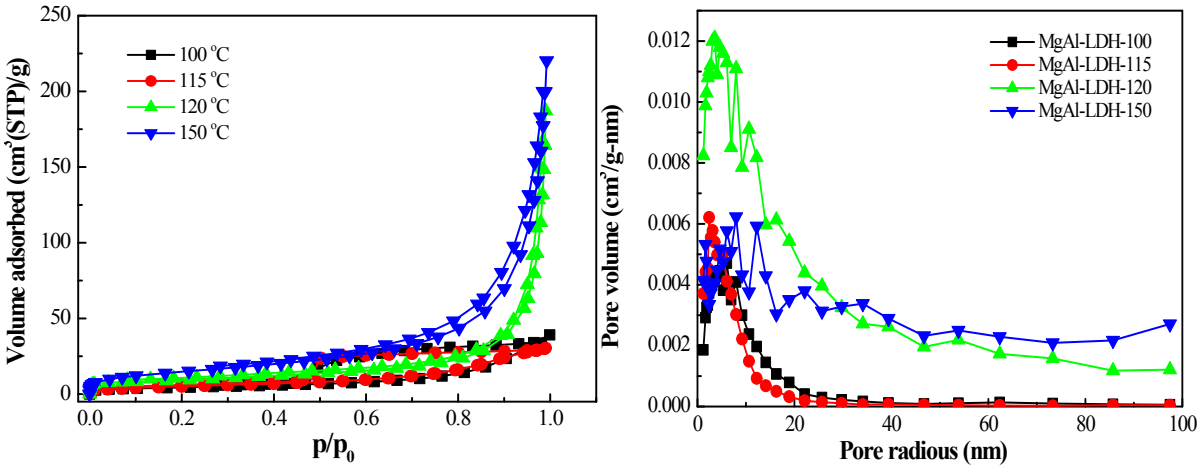


Fig. S6 Nitrogen adsorption-desorption isotherms of MgAl-LDHs synthesized at various temperatures.

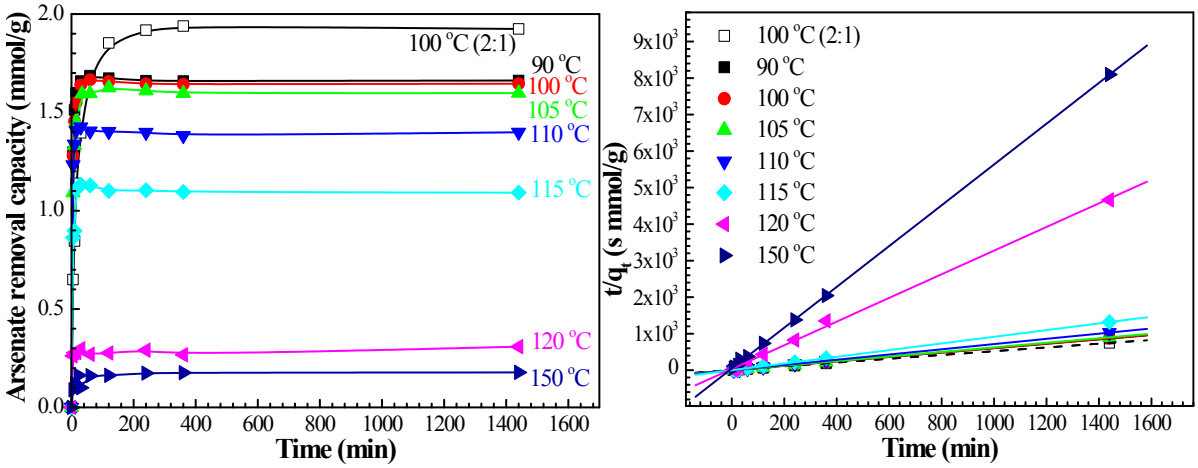


Fig. S7 Kinetic linear fittings of Ho's pseudo-second order model.

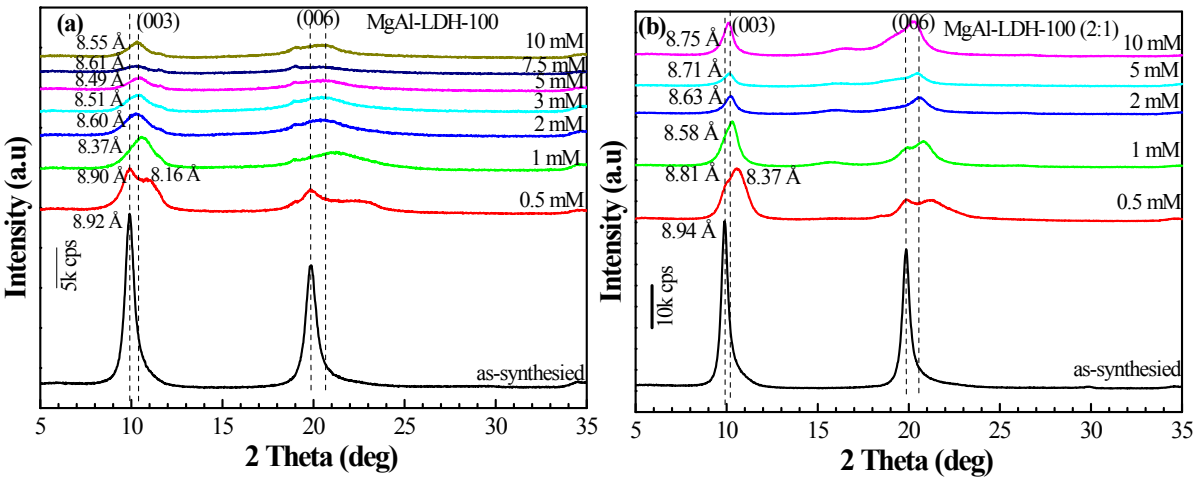


Fig. S8 (a) PXRD patterns of (a) MgAl-LDH-100 and (b) MgAl-LDH-100 (2:1) after sorption of arsenate at different concentrations.

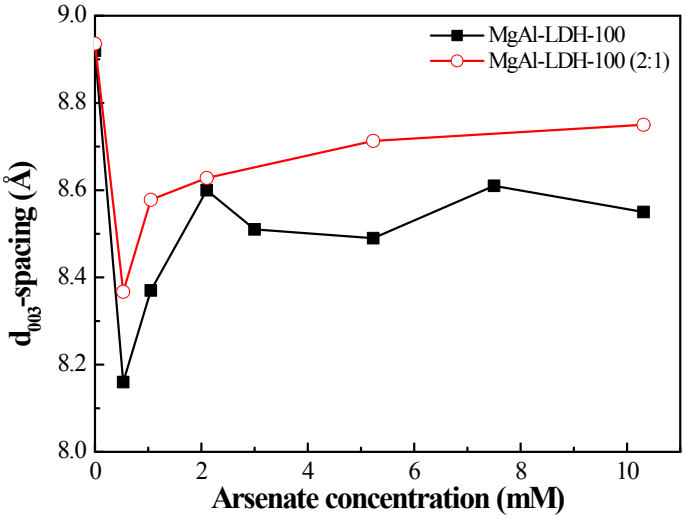


Fig. S9 The d_{003}-spacing of MgAl-LDH-100 and MgAl-LDH-100 (2:1) after sorption of arsenate at different concentrations.

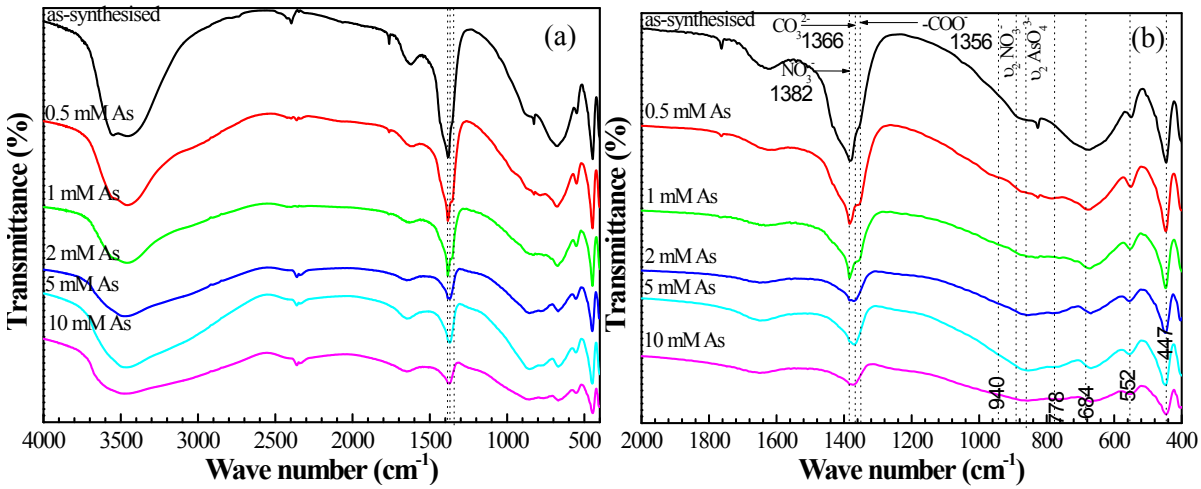


Fig. S10 (a) FT-IR spectra of MgAl-LDH-100 (2:1) after sorption of arsenate at different concentrations (b) and their expanded regions.

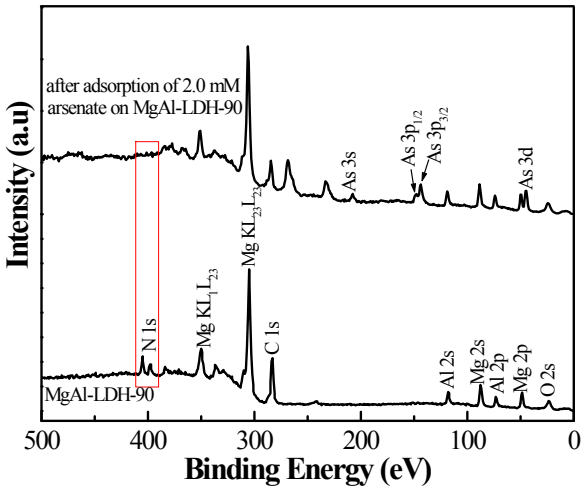


Fig. S11 XPS survey spectra of MgAl-LDH-90 before and after adsorption of 2.0 mM arsenate.