Electronic Supplementary Information

Amino organosilane grafted ordered mesoporous alumina with enhanced adsorption performance towards Cr(VI)

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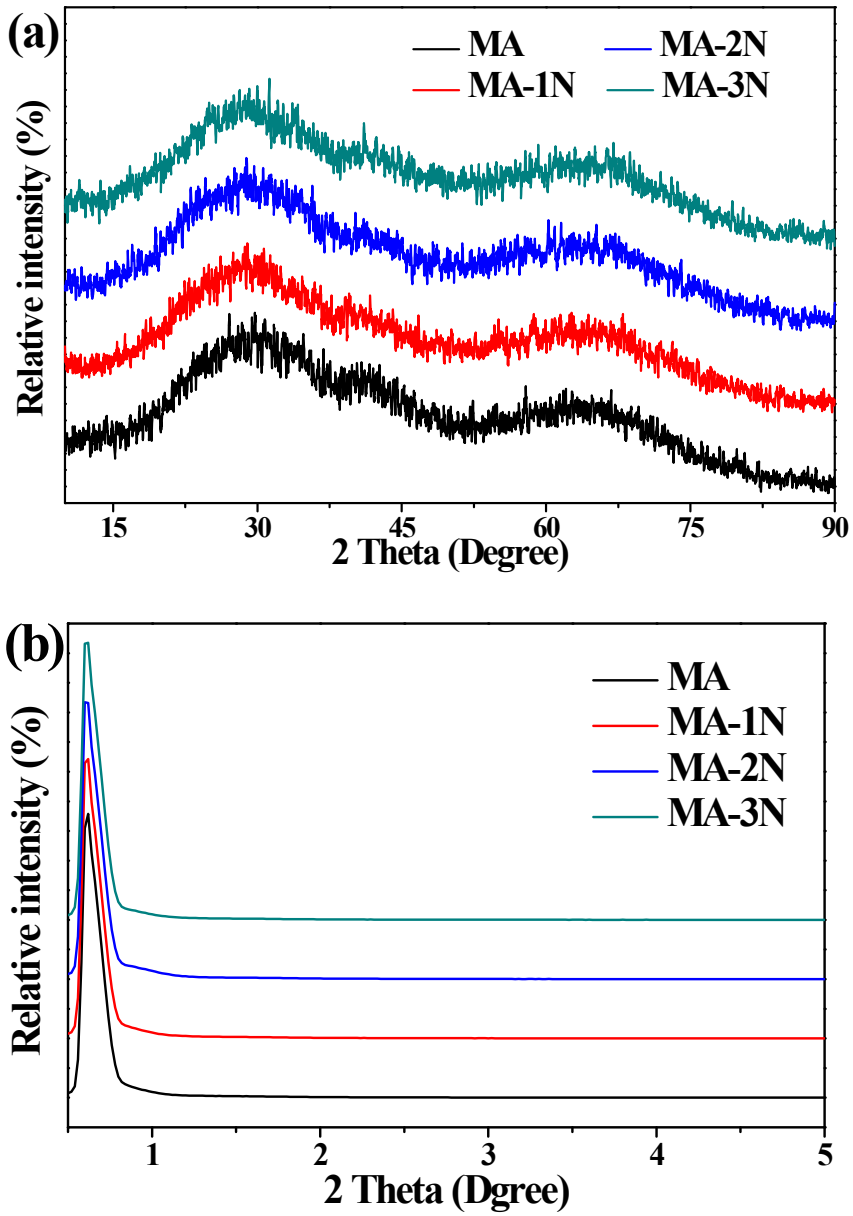


Fig. S1. Wide-angle XRD patterns and small-angle XRD patterns of the samples.

Fig. S1 shows the wide-angle XRD pattern of the samples, and their patterns are present amorphous state. The crystalline state of the ordered MA depends on the calcinations temperature of its precursor. Considering that higher temperature may result in lower active sites content and lower temperature leads to weaker mesoporous wall, 600 ℃ was chosen for the sake of balance between energy saving and particle mechanical strength. Fig. S2 shows that the small-angle XRD patterns present their

ordered structure properties, indicating that the grafting procedure does not destroy the mesoporous structure. Furthermore, this grafting method is also applicable for modifying commercial alumina with the same method, as shown in Fig. S2.

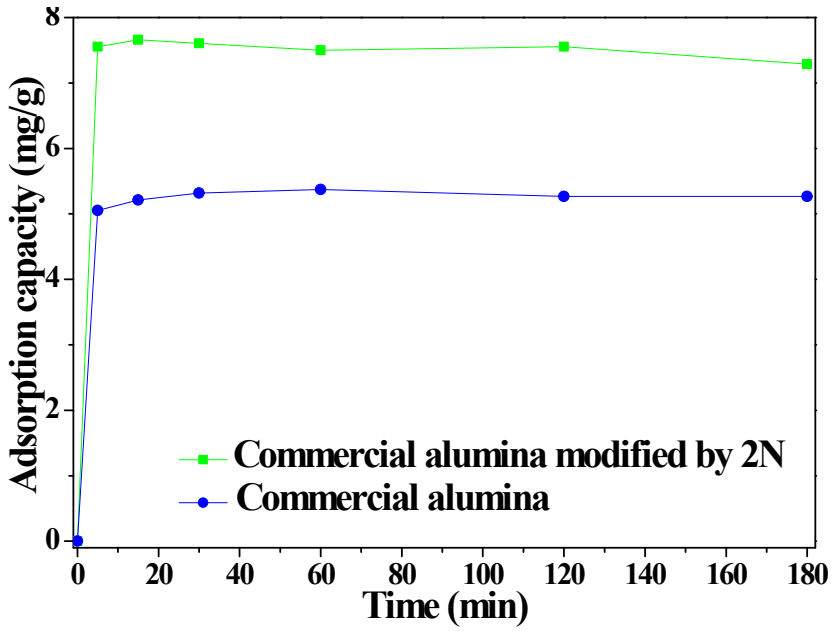


Fig. S2 Effect of contact time about Cr(VI) adsorption on commercial alumina before and after grafting of 2N using the same method.

Usually, with higher functional group loading amount, the performance of an adsorbent may decrease due to the steric hindrance effect. Furthermore, higher amount also increases the cost of a hybrid adsorbent. Here we tested the adsorption efficiency of a series of samples modified by 2N with different organosilane additive amount (varying from 0.25 to 1 g organosilane per gram original alumina), shown in Fig. S3. The results showed that only the wastewater treated by MA-2N-0.5 reaches the emission standard of WHO. The analogous tendency also occurs for the samples modified by 1N and 3N, and the sample modified with 0.5 g additive shows the best adsorption performance. Therefore, 0.5 g additive was chosen as the appropriate addition amount.

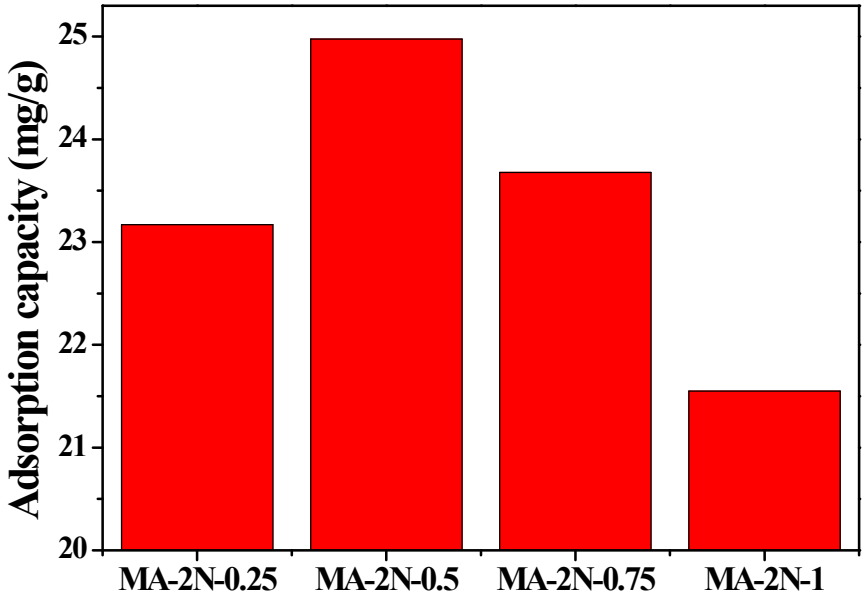
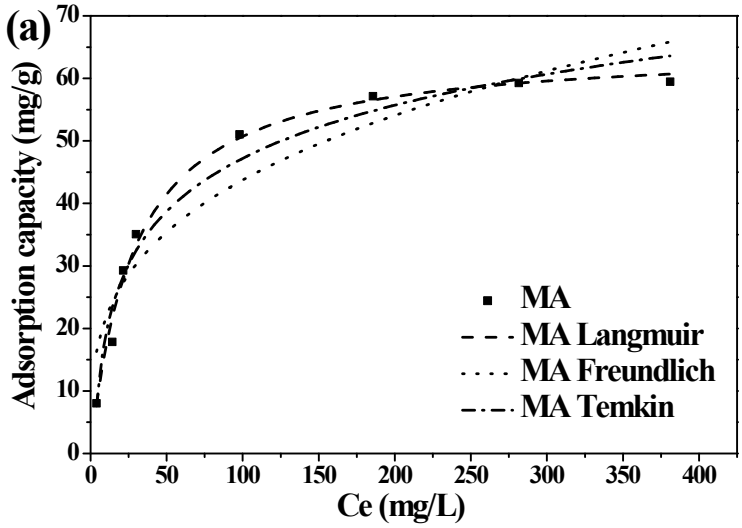


Fig S3. Effect of grafting amount of N-(β-aminoethyl)-γ-aminopropylmethylbimethoxysilane on Cr(VI) adsorption for MA-2N

Three adsorption isotherm models including Langmuir, Freundlich and Temkin were used to fit the adsorption isotherms. The fitted patterns were shown in Fig. S4. Wide scan XPS spectra were used to determine the existence and chemical state of elements in the samples. The full-range XPS spectra before and after modification with 2N were shown in Fig. S5. The results were consistent with the FT-IR and CHNS elemental analysis results.



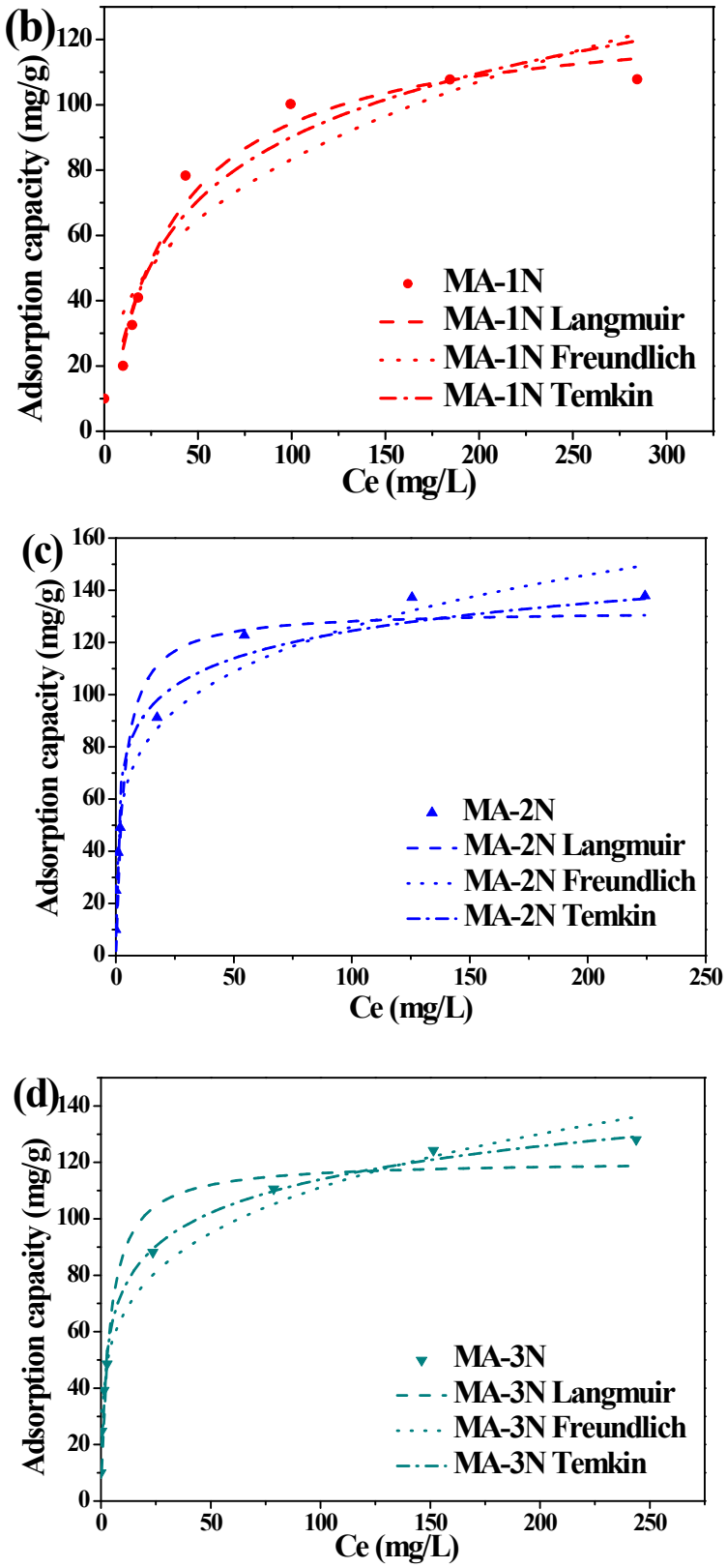


Fig S4. Cr(VI) adsorption isotherms fittings of the samples: MA (a), MA-1N (b), MA-2N (c) and MA-3N (d).

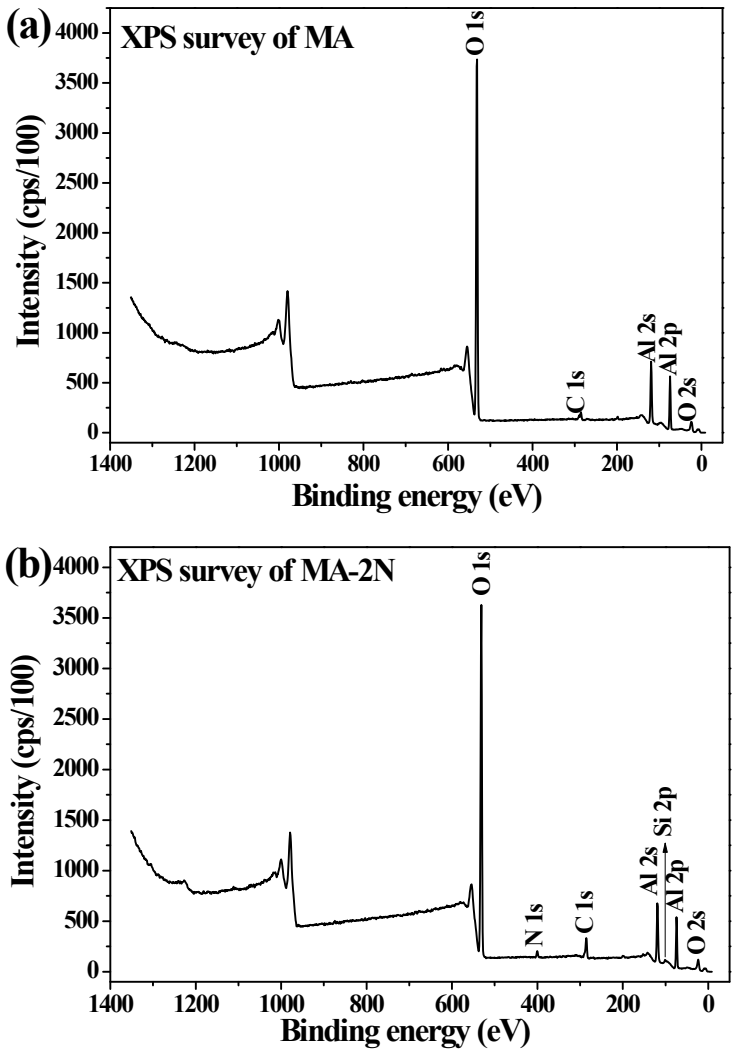


Fig. S5. XPS full spectra of MA (a) and MA-2N (b).