Article

Effective Removal of Humic Acid by Zr–MOFs with Surface Modification

Yuankang Jiang, Zhenggang Wang, Zhiping Zhu *, Mingpeng He and Pan Zhou

School of Chemistry and Chemical Engineering, Changsha University of Science and Technology, Changsha 410114, China; 17336671180@163.com (Y.J.); zhenggangwang16@163.com (Z.W.); h18707488613@163.com (M.H.); 19109021166@stu.csust.edu.cn (P.Z.)

* Correspondence: zhuzp@csust.edu.cn

Table S1. The applied materials properties

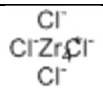
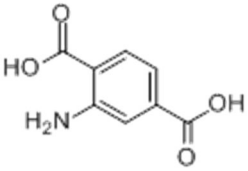
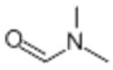
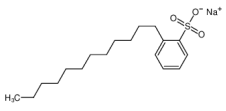
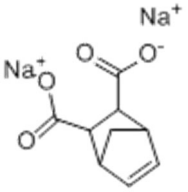
Material	Company	CAS number	Molecular weight (g mol^{-1})	Purity (%)	Molecular formula
Zirconium tetrachloride	Sinopharm	10036-11-6	233.04	98% ⩽ purity	
2-aminoterephthalic acid	Sinopharm	10312-55-7	181.14	95% ⩽ purity	
Dimethylformamide	Sinopharm	68-12-2	73.09	99.5 % ⩽ purity	
Sodium dodecyl benzene sulfonate	Sinopharm	25155-30-0	348.48	99.7 % ⩽ purity	
Ethanol absolute	Sinopharm	64-17-5	46.07	99.7 % ⩽ purity	
Humic acid, sodium salt	Sigma Aldrich	68131-04-4	-	95% ⩽ purity	

Table S2. Zeta potential of HA in water under different pH

pH	2	3	4	5	6
Zeta potential/mV	-16.08 ± 4.02	-0.39 ± 0.13	-33.69 ± 4.20	-41.92 ± 3.48	-35.11± 5.86

pH	7	8	9	10	11
Zeta potential/mV	-44.25 ± 7.19	-39.93 ±4.44	-39.22 ± 5.87	-39.60 ± 5.79	-48.43± 9.04

Megha syam Rauthula[1] et al. inspected a sorption of HA on activated carbon as 97.35 mg g^{-1} (pH5.6, T=303 k). Jianwei Lin[2] et al. investigated the adsorption of HA on surfactant-modified chitosan/zeolite composites and identified the adsorption capacity was 74.1 mg g^{-1} on chitosan/zeolite composites (pH7, T=30℃). Jihong Wang[3] et al. investigated HA adsorption on magnetically separable polyaniline and found the capacity of 36.36 mg g^{-1} (pH5.5-6, T=25℃). Jianchao Wang[4] et al. prepared Graphitic Carbon Nitride derived from urea by thermal polycondensation method and tested for HA adsorption. The maximum adsorption capacity was 73.24 mg g^{-1} (pH3, T=298K). Lingling Wang[5] et al. reported HA and Cr (VI) adsorption on ZnO-30N-zeolite as 33.4 mg g^{-1}. Therefore, it follows that the Zr-MOF exhibits much higher adsorption capacity than other adsorbents (pH under natural conditions, T=25℃).

References

1. Rauthula, M.S..V.C. Srivastava. *Studies on adsorption/desorption of nitrobenzene and humic acid onto/from activated carbon.* Chemical engineering journal, **2011**. 168(1): p. 35-43.

2. Lin, J..Y. Zhan. *Adsorption of humic acid from aqueous solution onto unmodified and surfactant-modified chitosan/zeolite composites.* Chemical engineering journal, **2012**. 200: p. 202-213.

3. Wang, J.;L. Bi. *Removal of humic acid from aqueous solution by magnetically separable polyaniline: Adsorption behavior and mechanism.* Journal of colloid and interface science, **2014**. 430: p. 140-146.

4. Wang, J.;D. Yue. *Insights into adsorption of humic substances on graphitic carbon nitride.* Environmental Science & Technology, **2021**. 55(12): p. 7910-7919.

5. Wang, L.;D.D. Dionysiou. *Removal of humic acid and Cr (VI) from water using ZnO–30N-zeolite.* Chemosphere, **2021**. 279: p. 130491.