

Accepted Manuscript

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PII: S1385-8947(18)30473-X
DOI: <https://doi.org/10.1016/j.cej.2018.03.115>
Reference: CEJ 18722

To appear in: *Chemical Engineering Journal*

Received Date: 14 January 2018
Revised Date: 20 March 2018
Accepted Date: 21 March 2018

Please cite this article as: M. Hui, P. Shengyan, H. Yaqi, Z. Rongxin, Z. Anatoly, C. Wei, A Highly Efficient Magnetic Chitosan “Fluid” Adsorbent with a High Capacity & Fast Adsorption Kinetics for Dyeing Wastewater Purification, *Chemical Engineering Journal* (2018), doi: <https://doi.org/10.1016/j.cej.2018.03.115>

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A Highly Efficient Magnetic Chitosan “Fluid” Adsorbent with a High Capacity & Fast Adsorption Kinetics for Dyeing Wastewater Purification

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Abstract: A novel magnetic fluid adsorbent (magnetic chitosan “fluid”, MCF) was prepared via a one-step *in situ* co-precipitation procedure using inexpensive and environmentally friendly chitosan (CS) and iron precursor. The resultant ultrafine colloid was characterized using transmission electron microscopy (TEM), X-ray powder diffraction (XRD), thermogravimetric analysis (TGA), and Fourier transform infrared spectroscopy (FTIR). The sorption and desorption characteristics of the composite were studied using a common Congo Red (CR) anionic dye to evaluate the suitability of the MCF for anionic dye wastewater purification. As an important advantage, the dye adsorption could be achieved in a wide alkaline pH range and reach the equilibrium within 5 min demonstrating the superior properties of our material compared the previously reported CS-based adsorbents. The adsorption obeyed the Langmuir isotherm model with the remarkable maximum adsorption capacity of *approx.* 1700 mg/g for CR under neutral pH. NaOH treatment was utilized to desorb and regenerate MCF, while the removal rate is still remained above 90% after recycling five times, demonstrating that the MCF could be employed for repeated use without significant capacity loss. MCF could be readily separated from water

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