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PII: S1385-8947(17)30730-1
DOI: http://dx.doi.org/10.1016/j.cej.2017.04.133
Reference: CEJ 16887

To appear in: *Chemical Engineering Journal*

Received Date: 27 March 2017
Revised Date: 26 April 2017
Accepted Date: 27 April 2017

Please cite this article as: S. Liu, S. Shinde, J. Pan, Y. Ma, Y. Yan, G. Pan, Interface-Induced Growth of Boronate-Based Metal-Organic Framework Membrane on Porous Carbon Substrate for Aqueous Phase Molecular Recognition, *Chemical Engineering Journal* (2017), doi: http://dx.doi.org/10.1016/j.cej.2017.04.133

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ABSTRACT: For metal-organic frameworks (MOF), introduction of special functional groups and integration on porous support will endow the MOF with specific molecular affinity and tunable membrane-like surface properties. Herein, we demonstrated a facile interface-induced Zn(II)-ligand-fragment co-assembly strategy to in situ fabricate boronate-based MOF membrane on hydrophobic porous carbon substrate for specific molecular recognition and separation. Due to the phenylboronic acid groups and hydrophobic porous carbon supporting layer, a catechol-containing medicinal natural flavone Luteolin was found to be efficiently and selectively recognized on the MOF composite in water-containing solution. As compared to the separated MOF particles and carbon substrate, the MOF composite exhibited similar adsorption kinetics but significant higher adsorption capacity in static separation. Dynamic separation also revealed that the MOF composite could achieve a desirable maximum adsorption capacity under mild separation condition, implying its applicability in industrial application. As a proof of this concept, a commercially available Luteolin with 85% purity could be easily extracted and concentrated to 99.90% purity by the MOF composite in highly aqueous solution, and the products possessed the similar antibacterial performance with standard substance. These results demonstrated that, a membrane-like functionalized MOF composite with enhanced surface hydrophobicity and improved molecular specificity has great potential for separation of industrial and even biological samples under water compatible conditions.

Keywords: Interface-induced growth, Boronate-based metal-organic framework membrane, Porous foam-like carbon substrate, Luteolin, Molecular recognition

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