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Fabrication of functional macroscopic polymer microtubes from *N*,*N*′-methylene bisacrylamide crystals and their adsorption for Cr(VI)

Yaqing Zhang[a], Botian Li[b], Liming Tang[a,*]

[a]*Key Laboratory of Advanced Materials of Ministry of Education of China, Department of Chemical Engineering, Tsinghua University, Beijing 100084, China, Tel. +(86) 13520654252; email: tanglm@tsinghua.edu.cn (L. Tang), Tel. +(86) 15201520774; email: zhangyaq14@mails.tsinghua.edu.cn (Y. Zhang)*
[b]*Department of Materials Science and Engineering, China University of Petroleum, Beijing 102249, China, Tel. +(86) 13426108042; email: libotian2012@sina.cn*

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ABSTRACT

In this article, functional macroscopic polymer microtubes were fabricated via two preparation steps. First, the reversible addition–fragmentation chain transfer polymerization of *N*,*N*′-methylene bisacrylamide (MBA) crystals directly, and then the modification of the resulting polymer tubes. Because the polymerization was confined at the outer layer of the crystals, polymer microtubes were successfully prepared after extracting MBA molecules from crude product by ethanol. Owing to the large size of the crystals, low temperature and high amount of initiator should be adopted to achieve adequate morphology for the tubes. The polymer microtubes were further reacted with tetraethylenepentamine (TEPA) in ethanol based on aza-Michael addition between acrylamide groups and amino groups. The existence of TEPA segments in the modified polymers was confirmed by Fourier-transform infrared, elemental analysis, thermogravimetric analysis and swelling ratio measurements. The modified polymer microtubes displayed high hydrophilicity and could be used as absorbent for Cr(VI) in water. The adsorption capacity increased as decreasing pH value and reached the maximum at pH 2.5. The maximum adsorption capacity was estimated to be 95.2 mg/g by Langmuir adsorption model which fitted the data quit well. The modified polymer microtubes displayed good recycling performance as well.

Keywords: RAFT polymerization; Methylene bisacrylamide crystal; Macroscopic polymer microtube; Supramolecular chemistry; Adsorption of Cr(VI)

* Corresponding author.