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磁性分子印迹材料对双酚A的识别与选择性吸附

Identification and selective adsorption of bisphenol A by magnetic molecularly imprinted particles

关键词：磁性分子印迹材料 双酚A 环境雌激素 特异性吸附

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摘要：通过简单的溶胶-凝胶法制备了以Fe_3O_4@SiO_2为载体的磁性分子印迹材料（MMIPs），通过TG、FT-IR、VSM和TEM等方法对其物理化学性质进行了表征，并研究了其对双酚A（BPA）的识别与选择性吸附性能.研究发现印迹材料对BPA有特殊的吸附能力，即能够与BPA上的酚羟基发生键合形成氢键，其对BPA的吸附符合Langmuir吸附模型和拟二级吸附动力学；且在pH=6时，其对BPA的吸附能力达到最强，为18.37 mg · g^{-1}（温度为25 ℃，时间为60 min）.与其它结构相似的酚类化合物相比，MMIPs对BPA的吸附最强，具有选择识别性；可利用良好的磁性（15.4 emu · g^{-1}）使BPA从溶液中分离去除；并且MMIPs可以循环使用6次；此材料在微量BPA的提取、分离与吸附等领域具有应用价值.

Abstract: Magnetic molecularly imprinted particles (MMIPs) were prepared through simple sol-gel method by using Fe_3O_4@SiO_2 as the support. Its physical and chemical properties were characterized by TG, FT-IR, VSM and TEM. Recognition and selective capacity of MMIPs for adsorption of bisphenol A (BPA) was studied. Results showed that MMIPs had specific adsorption capacity for BPA, which can bind with the phenolic hydroxyl group of the BPA to form the hydrogen bonds. Adsorption of BPA on the MMIPs can be described by Langmuir adsorption model and pseudo-second adsorption kinetics. Furthermore, at pH=6, the maximum adsorption capacity (18.37 mg · g^{-1}) of MMIPs was obtained (25 ℃ and 60 min). Moreover, MMIPs had the strongest adsorption capacity for BPA in comparison with other phenolic analogues. After adsorption, MMIPs (15.4 emu · g^{-1}) was separated from the water by the external magnet, which could be reused for 6 times. The MMIPs can be used in the extraction, separation and adsorption of trace amounts of BPA.

Key words: magnetic molecularly imprinted particles bisphenol A environmental estrogens specific adsorption