

多孔水凝胶P(HEA/AMPS)对水溶液中 Fe(III) 的吸附

Adsorption behaviour of Fe(III) in solution by hydrogel P(HEA/AMPS)

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中文摘要:

以2-丙烯酸羟乙酯(HEA)和2-丙烯酰胺基-2-甲基丙磺酸(AMPS)为单体合成了聚合物水凝胶(PHEA/AMPS), 采用水凝胶对水溶液中Fe(III)的吸附行为进行了研究。实验主要考察了聚合物组分、溶液pH、初始Fe(III)浓度和吸附时间对水凝胶吸附作用的影响, 并通过FT-IR和XPS分析了吸附前后水凝胶的变化。结果表明, 当单体摩尔比AMPS: HEA=1: 1, pH=2时, 水凝胶对Fe(III)的吸附容量最大。水凝胶对水溶液中Fe(III)的吸附容量随着溶液中初始Fe³⁺浓度的增加而增加, 但当初始Fe³⁺的浓度达到1 g/L时, 吸附容量基本达到饱和。吸附等温线符合Langmuir等温线方程, 吸附动力学符合准二级模型。FT-IR和XPS的分析表明, 水凝胶的磺酸基和酰胺基是吸附Fe³⁺的有效功能性基团, 吸附机理为螯合和离子交换。

英文摘要:

2-Hydroxyethyl acrylate (HEA) and 2-acrylamido-2-methyl propane sulfonic acid (AMPS) based hydrogel was synthesized by gamma radiation and the removal behaviour of Fe(III) from aqueous solution by the prepared HEA/AMPS chelating copolymer was examined with batch experiment. The influence of composition of hydrogel, pH, the initial feed concentration and time on adsorption capacity was studied. Hydrogels before and after heavy metal adsorption were characterized by FT-IR and XPS. The results show that the optimum solution pH is 2 and the optimum monomer ratio is AMPS: HEA=1: 1 for adsorption of Fe³⁺. The adsorption capacity increases with the increase of initial feed concentration of Fe³⁺. However, when the initial feed concentration is over 1 g/L, the adsorption capacity gets to saturation. Adsorption isotherm fits Langmuir equation. Adsorption kinetic follows the pseudo-second-order kinetic mode. The analysis of FT-IR and XPS proves the efficient activity of amide and sulfonyl group in Fe³⁺ adsorption as function group. It is predicted that the mechanism of adsorption by hydrogel contains both ion exchange and chelate with heavy metal ions.

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