

材料化学工程与纳米技术

含荧光基团的AA-AMPS共聚物的合成及性能

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摘要

以4-溴-1,8-萘二甲酸酐和N-甲基哌嗪为原料,合成得到一种新的荧光单体4-(N'-甲基-1-哌嗪基)-N-丁基-1,8-萘二甲酰亚胺烯丙基氯季铵盐(FC)。通过红外光谱、核磁共振及元素分析对FC进行了表征。将FC与丙烯酸(AA),2-丙烯酰胺基-2-甲基丙磺酸(AMPS),次亚磷酸钠共聚制备了含荧光基团的AA-AMPS共聚物(FC-POCA)。对该共聚物的荧光性质和阻垢性能进行了研究,结果表明:共聚物的荧光强度与其质量浓度呈良好的线性关系,线性相关系数为0.9578,检测下限为 $0.65 \text{ mg} \cdot \text{L}^{-1}$;采用静态法,当药剂量为 $20 \text{ mg} \cdot \text{L}^{-1}$ 时对碳酸钙阻垢率可达77.2%,当药剂量为 $25 \text{ mg} \cdot \text{L}^{-1}$ 时对硫酸钙阻垢率已经达到100%,与市售的POCA相当,达到了阻垢剂的阻垢分散性能要求。通过扫描电镜观察发现FC-POCA对 CaCO_3 垢既有较强的分散作用又具有明显的晶格畸变能力。

关键词

[共聚物](#) [阻垢](#) [合成](#) [荧光](#)

分类号

Preparation and performance of 2-acrylamido-2-methyl-propanesulfonic acid /acrylic acid copolymer containing fluorescent group

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Abstract

A novel water soluble fluorescent monomer, 4-(N'-methyl-1-piperazinylallyl)-N-butyl-naphthalimide allyl chloride quaternary ammonium salt (FC) was synthesized from 4-bromo-1,8-naphthalic anhydride and N-methylpiperazine. Its structure was characterized by IR, ^1H NMR and elemental analysis. The 2-acrylamido-2-methyl-propanesulfonic acid /acrylic acid copolymer containing fluorescent group (FC-POCA) was prepared by copolymerization of FC, acrylic acid (AA), 2-acrylamido-2-methyl-propanesulfonic acid (AMPS) and NaPO_3 . The fluorescence and scale inhibition performance of FC-POCA was investigated. The relationship of fluorescence intensity and concentration of FC-POCA was linear, and the correlation coefficient (R) was 0.9578, and the limit of detection was $0.65 \text{ mg} \cdot \text{L}^{-1}$. By the static method, the scale inhibition ratio of CaCO_3 was 77.2% when the copolymer concentration was $20 \text{ mg} \cdot \text{L}^{-1}$, scale inhibition ratio of CaSO_4 was 100% when the copolymer concentration was $25 \text{ mg} \cdot \text{L}^{-1}$. The results by SEM showed that the copolymer had high performance of scale inhibition on both dispersion and lattice distortion of CaCO_3 .

Key words

[copolymer](#) [scale inhibition](#) [synthesis](#) [fluorescence](#)

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