

油酸钠对油相法制备的 Fe_3O_4 纳米粒子的表面改性研究

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摘要 以常见的表面活性剂油酸钠作为表面改性剂, 通过油酸根离子中的脂肪烃链与高温油相法制备的 Fe_3O_4 纳米粒子表面的亲油性基团之间的范德华力作用, 将分散在油相中的 Fe_3O_4 纳米粒子转移到水相中。

研究了油酸钠浓度、油相中 Fe_3O_4 纳米粒子含量、pH值及温度等条件对改性结果的影响; 用穆斯堡尔谱仪(Mossbauer)、透射电镜(TEM)、傅立叶红外光谱(FT-IR)等方法对改性前后的样品进行了表征. 结果表明:

本方法可有效地将油相法制备的 Fe_3O_4 纳米粒子从油相中转移到水相. 当油酸钠浓度为3mmol/L、 Fe_3O_4

纳米粒子在正己烷中浓度为12.28mg·mL⁻¹、pH为8.6且温度为60℃时, 转移率最高可达86%,

改性后粒子在水相中的含量最高可达10.5mg·mL⁻¹; 改性后磁性粒子在水相中含量较低时, 能够稳定分散较长时间.

关键词 [油酸钠](#) [Fe₃O₄](#) [纳米粒子](#) [表面改性](#)

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Surface Modification of Fe_3O_4 Nanoparticles Prepared in High Temperature Organic Solution by Sodium Oleate

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Abstract Sodium oleate was used as surface modification agent to modify Fe_3O_4 nanoparticles prepared in high temperature organic solution. Fe_3O_4 nanoparticles were transferred from organic phase to aqueous solution by the van der Waals interaction between the long aliphatic chain of oleate anion and the hydrophobic groups in the surface of Fe_3O_4 nanoparticles. Effects of concentration of sodium oleate, pH and temperature on surface modification of Fe_3O_4 nanoparticles were investigated. Mossbauer spectroscopy, Transmission electron microscopy (TEM) and Fourier transform-infrared (FT-IR) spectroscopy were used to characterize samples before and after modification. The results show that the method is effective in transferring Fe_3O_4 nanoparticles from organic phase to aqueous solution. The ratio of Fe_3O_4 nanoparticles transferred from organic phase is as high as 86% and the content of transferred Fe_3O_4 nanoparticles in aqueous solution is 10.5mg·mL⁻¹ on condition that the concentration of sodium oleate solution is 3mmol/L, the content of Fe_3O_4 nanoparticles in n-hexane is 12.28mg·mL⁻¹, pH is 8.6, temperature is 60℃, respectively. The surface modified Fe_3O_4 nanoparticles with low concentration in aqueous solution can stably disperse in aqueous solution for a long time.

Key words [sodium oleate](#) [Fe₃O₄](#) [nanoparticles](#) [surface modification](#)

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