

## 掺硅对 $\gamma$ -Fe<sub>2</sub>O<sub>3</sub>微粒的结构和磁性能的影响

朱以华,李春忠

华东理工大学技术化学物理研究所,华东理工大学国家超细粉末工程研究中心

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**摘要** 本文采用掺硅制得了小尺寸的含硅 $\gamma$ -Fe<sub>2</sub>O<sub>3</sub>微粒。基于Furuhashi方法对不同硅含量的掺硅 $\gamma$ -Fe<sub>2</sub>O<sub>3</sub>微粒进行了X射线衍射结构研究。结果表明,随着硅含量增加,晶胞参数逐渐减小,表明形成掺硅 $\gamma$ -Fe<sub>2</sub>O<sub>3</sub>固溶体。掺入的Si<sup>4+</sup>阳离子有很强的占据类尖晶石结构中四面体位的趋势,对氧参数及四面体位和八面体位的平均间隙大小也有一定影响。本文还利用Stokes和Wilson公式计算了掺硅晶粒大小和晶格畸变的影响。发现随着掺硅量增大,晶粒尺寸明显减小,晶格畸变变化不大。最后对掺硅 $\gamma$ -Fe<sub>2</sub>O<sub>3</sub>磁粉的矫顽力和比饱和磁化强度作了详细的分析和讨论。

**关键词** 硅 X射线衍射分析 氧化铁 掺杂 磁性

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## Influence of silicon doping on the structure and the magnetic property of $\gamma$ -Fe<sub>2</sub>O<sub>3</sub> particle

ZHU YIHUA,LI CHUNZHONG

**Abstract** The structure of Si-doped  $\gamma$ -Fe<sub>2</sub>O<sub>3</sub> small particles prepared by doping with different silicon content has been investigated by X-ray diffraction based on Furuhashi method. The results show that the lattice parameters decrease continuously with increasing silicon content, which suggests an evidence of a solid solution for Si-doped  $\gamma$ -Fe<sub>2</sub>O<sub>3</sub>. The Si<sup>4+</sup> cation in the like-spinels appears a strong tendency to distribution in the tetrahedral site. The oxygen parameter as well as the mean size of interstices of tetrahedral and octahedral also appears a certain influence of silicon doping. Additionally, grain sizes and lattice distortions of the samples which were calculated following the Stokes and Wilson formula indicate a significant decrease for the grain size with increasing silicon content and a little change for the lattice distortion. Finally, the coercivity and saturation magnetization of the Si-doped  $\gamma$ -Fe<sub>2</sub>O<sub>3</sub> particles are discussed.

**Key words** SILICON X-RAY DIFFRACTION ANALYSIS IRON OXIDE DOPE MAGNETISM

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