

论文

环氧树脂修饰微米片状Fe粉的制备与电磁性能

董德明, 官建国, 王维, 李维, 周静

武汉理工大学材料复合新技术国家重点实验室, 武汉 430070

摘要:

通过γ-氨丙基三乙氧基硅烷--双酚A二缩水甘油醚与微米片状Fe粉表面的化学反应, 制备了表面修饰环氧树脂膜的微米片状Fe粉. 用FTIR, SEM, AFM和矢量网络分析仪分析了表面修饰环氧树脂膜的微米片状Fe粉的结构、形貌、表面状态和微波电磁性能. 结果表明, 在微米片状Fe粉表面修饰环氧树脂, 能在其磁导率基本保持不变的前提下显著降低介电常数, 其中虚部降低达到30%-80%以上, 从而明显改善吸波性能.

关键词: 微米片状Fe粉 介电常数 表面改性 环氧树脂

PREPARATION AND ELECTROMAGNETIC PROPERTIES OF MICROMETER Fe FLAKES MODIFIED WITH EPOXY RESIN

DONG Deming, GUAN Jianguo, WANG Wei, LI Wei, ZHOU Jing

State Key Laboratory of Advanced Technology for Materials Synthesis and Processing, Wuhan University of Technology, Wuhan 430070

Abstract:

Ferromagnetic metallic flakes show high magnetic permeability in gigahertz frequency due to their large saturation magnetization and the effect of particles shape. However, their permittivity is too large to wave impedance matching and to application as microwave absorbent. In this paper, the surfaces of micrometer Fe flakes were modified by a thin layer of epoxy resin based on the reaction of hydroxyl groups anchored in the surface of Fe flakes with 3-aminopropyltriethoxy silane and diglycidyl ether of bisphenol A. The structure, morphology, surface state and microwave electromagnetic properties of the as-prepared products were characterized by Fourier transformed infrared spectra, scanning electron microscopy, atomic force microscopy, and network analyzer. The results show that compared with the pristine Fe flakes, the Fe flakes modified by a thin layer of epoxy resin exhibit a substantially decreased complex permittivity, particularly the imaginary part decreased by 30%-80%, but remain almost the same magnetic permeability, which is an absorber with excellent microwave absorbing properties. At the same time, the surface modification mechanism was proposed. Compared with traditional core-shell modification, the method presented is effective for continuously tuning permittivity of electromagnetic wave absorbents.

Keywords: micrometer Fe flake permittivity surface modification epoxy resin

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通讯作者: 官建国

作者简介: 董德明, 男, 1984年生, 硕士生

作者Email: guanjg@whut.edu.cn

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