

## 溶膠－凝膠法製備鋇鐵氧磁體吸波材料之研究

### Fabrication of Barium Ferrite for Electromagnetic Wave Absorbing Materials by Sol-gel Method

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#### 摘 要

本研究係以溶膠－凝膠法製作出鋇鐵氧磁體，並於導電布上披覆鋇鐵氧磁體/PU 作為電磁波吸收層，以探討其吸波特性和。溶膠－凝膠法製程係改變錳、鈷、鈦含量來取代鐵，製備出鋇鐵氧磁體之吸收體，以 PU 樹脂為黏結劑，塗佈於導電布上，製作塗覆型吸波複合材料。探討在不同的錳、鈷、鈦添加比例、pH 值、等參數所得鋇鐵氧磁體對吸波特性和之影響。並且利用場發射掃描式電子顯微鏡 (FE-SEM)、X-射線繞射儀 (XRD)、磁力量測儀 (AGM) 及網路向量分析儀等，分別對吸波體之結晶形態、成分、晶體結構、磁滯曲線及吸波效率等加以分析觀察。依實驗結果顯示，添加錳鈷鈦並不會影響鋇鐵氧磁體的晶體結構，當錳鈷鈦含量增加時，鋇鐵氧磁體繞射峰大小降低，矯頑磁力也跟著減小，晶粒大小也縮小。在吸波特性和上，鐵氧磁體添加氧化鉍後，電磁波吸收頻段有往低頻方向移動之趨勢，添加量達 8wt% 時， $\text{BaFe}_{10}(\text{Mn}_{0.5}\text{Co}_{0.5}\text{Ti})\text{O}_{19}$  在 pH=3 及 pH=4 其最低的電磁波吸收頻率則降低到 1~300 kHz。

**關鍵詞：**溶膠－凝膠法、鋇鐵氧磁體、塗覆型吸波複合材料、磁滯曲線、電磁波吸收。

#### Abstract

The Barium ferrite is fabricated by sol-gel method and the coating-type absorption composite material is obtained by coating the ferrite / PU mixture on conductive woven fabric. The different manganese, cobalt, titanium addition, pH, amount of bismuth oxide and coating thickness are explored as the experimental parameters. The FE-SEM, EDS, XRD, AGM and VNA are used to observe the surface of the absorbing body type, composition, crystal structure, the hysteresis curve and efficiency analysis of absorption, respectively. The results show that adding manganese, cobalt and titanium will not affect the crystal structure. When the manganese, cobalt and titanium content increased, a decrease in diffraction peak are obtained, the coercivity and grain size have also been reduced. Moreover, when the bismuth oxide is added to 8 wt%, the absorption band of electromagnetic waves between 1~300 kHz is measured for the  $\text{BaFe}_{10}(\text{Mn}_{0.5}\text{Co}_{0.5}\text{Ti})\text{O}_{19}$  at the pH = 3 and pH = 4.

**Key words:** sol-gel method, barium ferrite, coating-type absorption composite material, hysteresis curve, electromagnetic wave absorption

100 年 9 月 6 日收件 100 年 11 月 18 日受理

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