华东师范大学学报(自然科学版) 2008 2008 (5): 104-109 ISSN 1000-5641 CN 31-1298/N

应用物理,电子学

溅射工艺对NiFe/Cu复合丝结构和性能的影响

蒋玲，阮建中，赵强，王清江，赵振杰

华东师范大学 物理系，纳光电集成与先进装备教育部工程研究中心，上海200062

收稿日期 2008-1-22 修回日期 2008-2-25 网络版发布日期 2008-10-7 接受日期 2008-4-10

摘要 利用射频磁控溅射法分别采用连续溅射和间歇溅射工艺制备了Ni80Fe20/Cu复合结构丝。通过扫描电镜和X射线衍射等手段研究了溅射模式对复合丝微观结构的影响. 结果表明：间歇溅射使镀层之间形成明显的界面，镀层结晶度增加，晶粒较大. 利用巨磁阻抗效应和磁滞回线手段分析了样品的磁性能，发现实验中溅射的磁性层具有良好的软磁性能，复合丝呈现出较大的巨磁阻抗效应. 当采用间歇溅射工艺时，由于复合丝的镀层中存在明显界面，内、外磁层的磁化行为不同，出现两个各向异性场. 该样品经退火后，释放了一部分内部应力，软磁性能提高，阻抗效应增强，且内、外磁层磁性能趋于一致.

关键词 复合丝；晶态结构；巨磁阻抗效应；各向异性场

分类号 0482.4

Influence of sputtering modes on the microstructure andmagnetic properties of NiFe/Cu composite wires(Chinese)

JIANG Ling,RUAN Jian-zhong,ZHAO Qiang,WANG Qing-jiang,ZHAO Zhen-jie

Department of Physics, Engineering Research Center for Nanophotonics & Advanced Instrument,Ministry of Education, East China Normal University, Shanghai200062, China

Abstract

In this work, we adopted two sputtering modes to prepare the NiFe/Cu composite wires: (i) the intermittent deposition mode; and (ii) the continuous deposition mode. SEM images confirmed that the intermittent deposition mode leads to interface creation among deposited layers. XRD results showed that the intermittently deposited sample has a better crystallite and a grain growth. GMI effect has been used as a tool to analyze the magnetic properties of the samples. The results showed that the sputtered magnetic layers exhibit good soft magnetic properties, and the composite wires showed large GMI effect. The MI profile for the intermittently deposited composite wire shows two peaks, which can be a result of the different magnetic properties of the inner and the outer magnetic layers. The inherent stresses are partially relaxed through heat treatment. The GMI effect of the composite wire is enhanced, and the magnetic properties of the two magnetic layers become similar.

Key words composite wire microstructure GMI effect anisotropy field

DOI:

通讯作者 赵振杰 zjzhao@phy.ecnu.edu.cn.