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研究论文

电结晶铜/钴纳米多层膜结构与磁性能研究

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摘要 以n型Si(111)为基底, 在硼酸镀液体系中采用双槽法电结晶制备Cu/Co纳米多层膜, 确定了工艺条件. 用扫描电镜(SEM)和X射线衍射(XRD)对纳米多层膜的结构和形貌进行了表征, 显示多层膜具有良好周期性和超晶格结构. 并用物性测量系统PPMS测试了不同结构 Cu/Co纳米多层膜的磁性能. 磁滞回线表明: 不同周期数的纳米多层膜其矫顽力均较小. 巨磁阻(GMR)性能与纳米多层膜结构有关. GMR值随Co磁性层厚度增长先增大后减小, 有一极值; 随着Cu非磁性层厚度的增加GMR值发生周期性的振荡; 随周期数*N*的增大, GMR值先增大, 在*N*为60时达到了90%, 随着*N*的继续增加而减小, 当达到80周期时, GMR值趋于稳定.

关键词 电结晶 Cu/Co纳米多层膜 X射线衍射 巨磁阻效应 磁滞回线

分类号

Study of Structure and Giant Magnetoresistance of Electrocrystallized Cu/Co Nanomultilayers

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Abstract Cu/Co Nanomultilayers were prepared on n-type Si(111) substrate by double-bath method in boric acid plating solution and the technical conditions were determined. The appearance and structure of nanomultilayers were examined by SEM and XRD methods. It has been shown that the nanomultilayers had periodical and superlattice structure. The physics property measurement system was used to characterize magnetic properties of nanomultilayers. The results showed that coercivity of these nanomultilayers with different periodicities was all small. In this paper, the correlation between structure of nanomultilayers and giant magnetoresistance (GMR) was studied. The GMR value was increased and then decreased with the increase of Co layer thickness, while changed periodically with Cu layer thickness. With stacking number *N* increased, the GMR value was increased firstly and then fell. The GMR value as large as 90% was found when *N* was increased to 60, while *N* reached 80, the GMR value was constant.

Key words electrocrystallization Cu/Co nanomultilayer X-ray diffraction giant magnetoresistance hysteresis loop

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