URN etd-0407109-183726-2208
Author Chih-Hsiung Tseng
Author's Email Address No Public.
Statistics This thesis had been viewed 40 times. Download 83 times.
Department
Year 2004
Semester 1
Degree Master
Type of Document Master's Thesis
Language zh-TW.Big5 Chinese
Title The Microstructure and Magnetic Properties of Co/Al2O3 Nanocomposite Prepared by Composite Electrodeposition
Date of Defense 0000-00-00
Page Count 95

Keyword
Composite Electrodeposition
Co/Al2O3

Abstract
In the study, nanocomposite Co/Al2O3 layers were fabricated by composite electrodeposition. Plating bath composition include cobalt sulfamate (CoSO4), cobalt chloride(CoCl2), boric acid(H3BO3), sodium chloride(NaCl) and nanosized Al2O3 powder with different volume concentration. Co ions and Al2O3 can codeposition of Cu substratum by DC current. Variable of current density, pH value of plating bath, temperature of plating bath, and adding content Al2O3 powder applied in this research. XRD was used to indentify the phases of pure Co and composite Co/Al2O3 layers. SEM was used to observe the surface morphology of pure Co and composite Co/Al2O3 layers for different prepare condition. AFM was used to measure surface roughness of pure Co and composite Co/Al2O3 layers. The microstructures elements of pure Co and composite Co/Al2O3 layers was analysis by TEM. Magnetic hysteresis loop and magnetic property of pure Co and composite Co/Al2O3 layers was measured by VSM.

The XRD results shows that the pure Co film is polycrystal , and appear preferred orientation with the condition of high pH value of plating bath and low temperature of plating bath, the Co deposition film shows (10.0)+(11.0) preferred orientation. Higher temperature of plating bath produce finer Co grain. When low pH value of plating bath was applied, (10.0) orientation increased with increasing temperature of plating bath. From SEM image, equaxial fine grain of pure Co prepared by low current density and low pH value of plating bath. As the pH value increases, a ridge-shape morphology of Co grain was present. If the current density increase further, appear pyramidal grain morphology was shown in Co matrix. The surface roughness measured by AFM showed that, there were maximum surface roughness of Co layers prepared in the bath of pH=2.9. Because the grains of fine grains and ridge-shape coexist in the surface. TEM images showed that column-shaped grain of pure Co α-hcp. VSM measure result find that saturation magnetization increased of with increasing pH value of plating bath, but the trend of squareness is opposite. The magnetic anisotropy increased with decreasing pH value of plating bath, the rotation angle of layer surface with extra magnetic field, find magnetic moment extend layer surface arrange.

The XRD result of study Co/Al2O3 composite layer, appear (11.0) preferred orientation. The grain shape of Co change to equaxial fine grain and refined by adding of Al2O3 powder. The surface roughness decreases when Al2O3 powder increases, and coercivity and squareness increased with increasing addition Al2O3 powder. For well-dispersed Al2O3 powder, appeared equaxial grain. But if the dispersive is poor, the powder don’t impede Co ions deposited and column-shaped morphology was shown.

Advisory Committee Sheng-Chang Wang - advisor

Files etd-0407109-183726-2208-001.pdf

indicate access worldwide
Date of Submission 2005-01-01