Abstract

Since Hard Disk Drive have became essential to the public in order to storage their massive information, it is in great demand for ultra-high recording density media. The previous disk is one of the products of longitudinal recording media; however, the physical limit had put a constraint on the development of longitudinal one. As a result, it is urgent to investigate a new type of perpendicular recording media and to push them into real products.

This study has emphasized on the investigation of CoPtCr-SiO_2 perpendicular media. To begin with recording layer deposited on Pt/Ru underlayers, it is the fundamental structure for the optimization of CoPtCr-SiO_2 perpendicular recording media. We apply Vibrating Sample Magnetometer (VSM), Perpendicular Magneto-Optical Kerr Effect Meter (PMOKE), X-Ray Diffraction (XRD) to analyze magnetic properties and crystallographic characteristics. In addition, we investigate the micro-structure and composition analysis by Transmission Electron Microscope (TEM) and Energy Dispersive X-ray Spectroscopy (EDS). Next, we introduce two series of buffer-layers to improve magnetic properties and microstructure, as well as the enhancement of segregation examined by curvature measurement. In addition, the effect of Ru working pressure on magnetic and structural properties was investigated with curvature measurement.

Finally, we would make the media examined by R&W tests in order to confirm the recording densities and performance for getting into products. As a consequence, the higher SNR performance of our media could promote the recording density to achieve even 100 Gb/in^2.

論文摘要

硬碟已經成為人們生活中不可或缺的產品之一，大量且容易獲得的資訊將需儲存在超高記錄的碟片裡，因此人們對於高記錄密度的硬碟的需求將越來越高。之前的硬碟是以水平式記錄碟片為主製成的產品，然而這樣的水平式媒體即將在追求超高記錄密度時遇到物理的極限。是以，目前最重要的是成功發展出垂直式記錄媒體的膜層結構，並進而推進成為新世代的硬碟產品來解決水平式硬碟將會發生的窘境。

本研究將著重在 CoPtCr-SiO_2 為記錄層的垂直式記錄媒體。首先我們將介紹以 Pt 和 Ru 為主的膜層結構，以及單層最佳化的參數進行 X-光繞射儀(XRD)、振動樣品測磁力計(VSM)、磁光柯爾效應儀(MOKE)分析晶體結構以及磁性質，並利用穿透式電子顯微鏡(TEM)、X 射線能量散佈分析儀(EDS)來進行成分以及微結構分析。接著我們將引入重要的 Tb 和 Ta 緩衝層來改善微結構以及磁性質表現，並利用曲率量測的方法輔助分析其改善偏析情況的原因。此外，提升 Ru 的工作氣壓對於膜層的晶體結構以及磁性的影響，也將利用曲率量測來輔助說明。

最後，我們將把成功發展出的結合記錄層系統以及軟磁層系統的完整膜層結構進行讀寫測試，並觀察其記錄密度以及讀寫性質的表現，其高訊雜比的結果將對於未來推廣至 100 Gb/in^2 超高記錄密度的垂直式記錄硬碟有莫大的益處。