

## **Title: Thin Film Technology for Perpendicular Magnetic Recording and Beyond**

### **Speaker:**

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**Time:** 11:30 am

**Venue:** Room 603, Chow Yei Ching Building

### **Abstract:**

Magnetic recording technology has shown a rapid growth over the past decades with the areal density growth rate more than 40% due to introduction of giant magneto-resistive (GMR), tunneling magneto-resistive (TMR) head and perpendicular recording technology. Current products are in the range of 400Gb/in<sup>2</sup> and demonstrations of more than 800Gb/in<sup>2</sup> have occurred for perpendicular recording. Recent progresses are mainly due to improvement of magnetic thin film media signal to noise ratio (SNR). It is believed that with a given medium SNR tolerance (15dB for example), perpendicular recording will face a limit, although much higher than that for longitudinal recording, soon. Thus lead to an urgent need for advanced recording media design that enable high areal density with enough SNR at ultra high density. In this talk, we give a brief review of recent progresses on perpendicular recording media technology and look at possible extension for ultra high areal density magnetic recording. Unlike traditional way to jump into materials property and medium growth condition, we review this progress based on learning from recording physics and media design concept, and show how the media technology progresses, i.e. technology development, against research focus. First the advantages of the perpendicular recording media as compared to longitudinal recording media are briefly summarized. Then we give a brief review on the learning from tilted media and the recording model for perpendicular recording system. Then the effect of media switching field and switching field distribution will be discussed. We show several additional media designs and show its impact to the recording technology, including media with media with coupled granular continuous (CGC) structure, media with exchange coupled composite structure and media with exchange spring system. In addition, we will discuss the impact of media grain size on achievable areal density, the ultimate limit for magnetic recording based on continuous media. Finally, a possible extension and its impact are discussed. As stated before, here we will not try to dig into very specific detail of each topic but look at the basic concept and physics behind each topic that may potentially lead to new technology break through.

### **Biography of the speaker:**

Kaizhong Gao received the B. S. degree from Peking University, the M.S. and Ph. D. Degrees in physics from the University of California, San Diego (UCSD). After receiving his doctorate, he joined Seagate Technology, working on advanced magnetic recording technologies. He is currently the Sr. manager of the Advance Technology Development group in Recording Head Operation, Seagate, Minnesota. His research interests included magnetic recording technologies, future information storage technologies, and spintronics applications.

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