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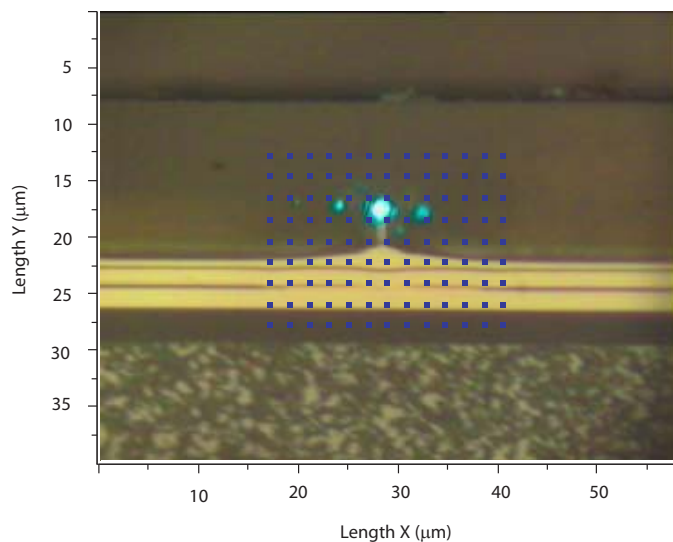
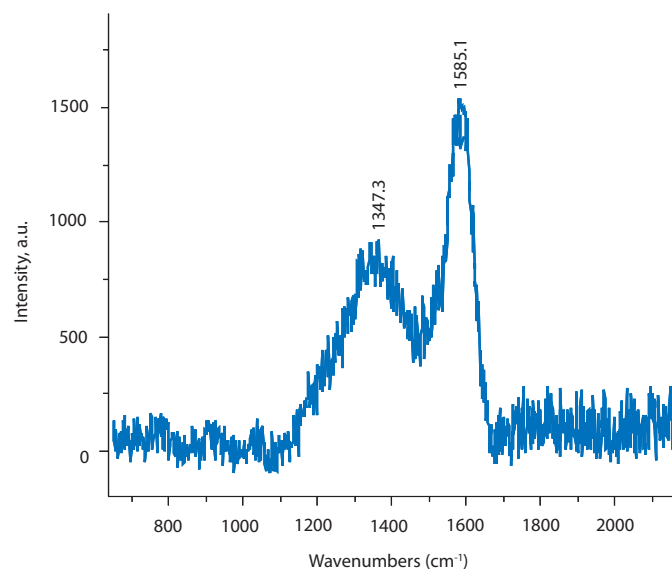
Diamond Like Carbon (DLC) Distribution on a Magnetic Head Surface

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Discussion

Carbon is used as a protective coating on magnetic recording disks and heads (as well as other industrial products). The thin carbon layer (5 - 10 nm) contains a significant concentration of sp^3 hybridized carbon that results in a hardness equivalent to 40% of that of diamond, thus its name, diamond like carbon (DLC). Layer thickness, uniformity and composition have to be carefully controlled in the carbon coating to produce the desired hardness and wear resistance. Raman spectroscopy can determine the layer thickness uniformity by mapping (imaging) the Raman scattering from the carbon layer.

A magnetic head surface was scanned by Raman micro-spectroscopy (Figure 1). The spectrum from a one micrometer spot, acquired using an Ar⁺ ion laser (514.5 nm) is shown in Figure 2. Two broad bands, the carbon D-band ($\sim 1347\text{ cm}^{-1}$) and the carbon G-band ($\sim 1585\text{ cm}^{-1}$), can also be used for the evaluation of DLC hardness. The total peak areas of these bands ($1200\text{-}1800\text{ cm}^{-1}$) are considered proportional to the carbon concentration (layer thickness) of each individual spot.

**Figure 1. Head surface showing Raman analysis areas****Figure 2. Carbon region of Raman spectrum from magnetic head**

The Raman intensities from the one micrometer spots in the area are mapped in a 3D plot (Figure 3). A Raman image of the carbon distribution is shown in Figure 4. The carbon concentration (layer thickness) is lowest in red areas and highest in blue areas.

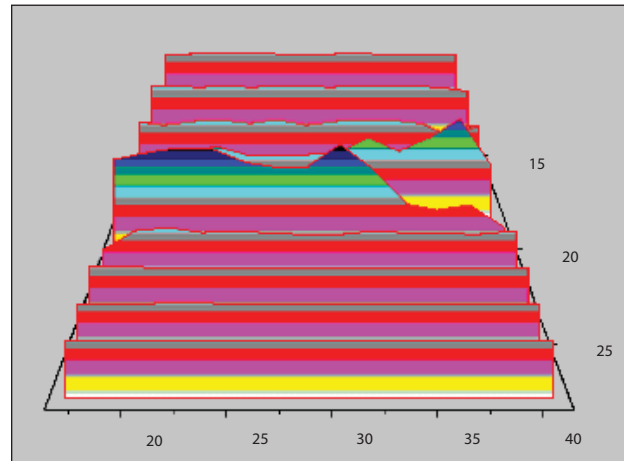


Figure 3. 3D plot of carbon intensity

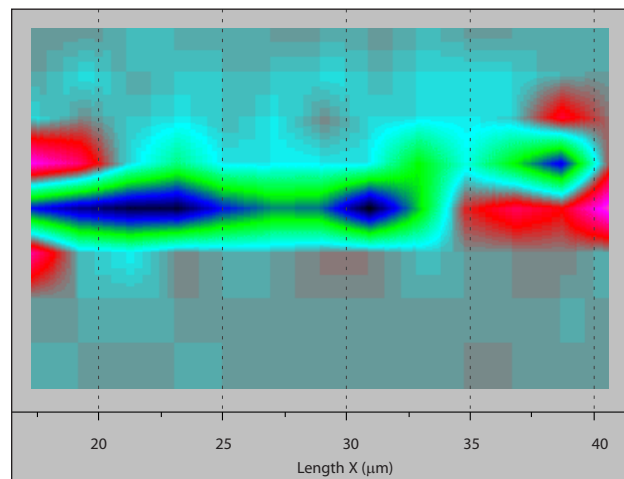


Figure 4. Areas of high (blue) and low (red) C concentration

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