

Scratching resistance of diamond-like carbon coatings in the subnanometer regime

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In order to examine the scratching resistance of ultrathin hydrogenated amorphous carbon (a-C:H) coatings used in magnetic storage devices, a large number of scratches with reproducible residual groove depths well below 1 nm has been examined. All measurements were carried out with an atomic force microscope and diamond-tipped cantilevers. The analysis of such shallow scratches is made possible by means of an image processing procedure which minimizes surface roughness effects using subtraction imaging. This method was applied to a series of sputter-deposited, fully aged, unlubricated amorphous coatings with different hydrogenations. For low hydrogen content in the sputtering gas, the scratching resistance decreased with an increasing amount of hydrogen, in accordance with many other experiments. In contrast, an unusual slight improvement of the scratching resistance for a further increase of hydrogenation was obtained.