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Elastic constants of Cr3C2 thin films by surface Brillouin scattering investigations

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Abstract content
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Thin hard films of transitional metal carbides have continued to be extensively investigated due to their widespread application as protective coatings. This is made possible by their excellent properties such as high hardness, high melting temperature, and chemical inertness under extreme environments. In this work, we investigate the propagation of surface acoustic wave and determine the elastic constants of Cr3C2 films on (001) Si. Cr3C2 thin films were deposited on etched (001) Si at a working gas pressure of 1.0 x10-3mbar and sputter power of 175W. The deposition rate, film density and interfacial roughness have been determined using X-ray Reflectometry (XRR). Surface Brillouin studies have shown the presence of Sezawa waves which indicate high film quality and low surface roughness as confirmed by X-ray Reflectometry. The dispersion curves have been used to extract the elastic constants to C11 = 275GPa, C33= 370GPa, C55= 86.9GPa and C13= 101GPa. The low values of the elastic constants are attributed to the microstructure of sputtered thin film which is less dense than the single crystal. The elastic anisotropy of the film shows that it is stiffer in direction perpendicular than parallel to the film (c11/c33 < 1) which is characteristic of thin films that have a columnar growth structure based on the zone structure model [1-2].

Keywords: elastic constants, transitional metal carbides, surface Brillouin scattering.

References

1.T. Wittkowski, J. Jorzick, K. Jung, B. Hillebrands, Elastic properties of thin h-BN films investigated by Brillouin light scattering, Thin Solid Films, 353 (1999) 137

2.J.A. Thornton, J. Vac. Sci. Technol. 11 (1974) 666.

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