

## Double layer TiB<sub>2</sub>-TiN Films

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TiB<sub>2</sub>/TiN and TiN/TiB<sub>2</sub> double layer films were prepared by means of Ion-Beam-Enhanced-Deposition (IBED) at room temperature. XRD, wear resistance, microhardness, scratch test and electrical resistivity were used to study their properties compared with single layer TiB<sub>2</sub> films.

A hexagonal TiB<sub>2</sub> (001) diffraction peak was on TiB<sub>2</sub>/TiN film by X-ray diffraction investigation, which do not appear in any single layer TiB<sub>2</sub> films and TiN/TiB<sub>2</sub> double layer films. It is due to the distance between Ti atoms in TiN (111) plane is similar to that in TiB<sub>2</sub> (001) plane, so TiB<sub>2</sub> crystallized easier on the surface of TiN with the similar crystalline.

The hardness of the double layer films is depend on the upper layer. The hardness of TiB<sub>2</sub>/TiN is equal to that of the single layer TiB<sub>2</sub> films. The critical load of both TiN/TiB<sub>2</sub> and TiB<sub>2</sub>/TiN films are 4.3Kg, higher than that of TiB<sub>2</sub> single films (2.8Kg). It implies that adhesion of double layer films is superior to that of single layer films. Wear test showed that the friction coefficient of the double layer films is lower than that of single layer films. The wear traces of the double layer films are more even and more smooth than the wear traces appeared on the surface of single films. These suggest that double layer structure enhanced wear resistance. The resistivity of the double layer films is the same as that of the single layer films.