Tomasz Mościcki[1)], Rafał Psiuk[1)] Dariusz Jarząbek[1)]
[1)]Institute of Fundamental Technlogical Research PAS, Warsaw, Poland

Micromechanical testing of magnetron sputtered W-Ti-B coatings from SPS targets

Abstract

The main problem of using super-hard and thermally resistant ceramic as protective layers is their brittleness and difficulties with adhesion to a much softer substrate. The last research has reported on flexible hard ceramic coatings prepared by magnetron sputtering. Among them tungsten diborides represent a new class of coatings which are simultaneously super-hard, tough and resistant to cracking. Alloying of WB_x with transition metal like titanium, zirconium or tantalum leads to considerable improvement of mechanical and tribological properties compared to undopped borides. In this stdies these special mechanical properties of W-Ti-B coatings were obtained thanks to the use of High Power Impulse Magnetron Sputtering (HIPIMS) which provide the suitable balance of energy at deposited surface. In this study the micromechanical tests were used for measurement of superhardness H > 42 GPa, high fracture toughness 3.5±0.1 MPa√m and those properties are better than for commercially used TiN coatings. Also nanopilar compressing and Stoney equation for compressive strength and film stress designation were used respectively. Alloyed with titanium coatings are well adherent to nitrided steal substrates, incompressible and wear resistant. HiPIMS sputtering from a single SPS' target reduces the cost of equipment (only one magnetron) and enables to decrease the deposition temperature to 300 C, which makes it possible to use it for larger dimension tools.

Acknowledgement

This work was funded by the National Science Centre (NCN, Poland) under project no. 2022/47/B/ST8/01296