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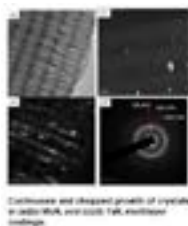
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Single element transition metal nitride protective sputtering coatings with versatile structural features

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Transition metal nitride, TMN, coatings had been proved to be excellent protective surface layers in recent decades owing to their promising corrosion resistance, high hardness and modulus, good adhesion onto various substrates, and pronounced tribological behavior. Tremendous efforts were made on characteristic enhancement of the nitride coatings with multicomponent and multilayer features for the past decade. In this work single element nitride films, including TaN, MoN, and HfN, were and were manipulated to form amorphous, crystalline, preferred structures by RF magnetron sputtering and dedicated parameter control. Through input power and source gas ratio modulation, TaN with amorphous/crystalline altering layer stacking, i.e. an a-TaN/cTaN multilayer coating, could be produced with tougher behavior. Less tribological failures for the multilayer TaN coatings, like scratch cracking and peeling, during scratch and dry sliding wear were observed as compared to single layer coatings. Likewise, superior mechanical properties and corrosion resistance were obtained for single element HfN multilayer film with HfN nanolayers deposited under various RF input powers. More promising effect on adhesion enhancement was found for the nanocrystalline/preferred-orientation-crystalline MoN multilayer coatings. The continuity of column structure found in single layer nitride coatings could be effectively suppressed by nanolayered stacking of single element nitride layers with different structure features. The modulated multilayer features were also beneficial to the mechanical characteristics. The effects of the modulation on mechanical characteristics of the multilayer nitride coatings, such as hardness, modulus, adhesion strength, and tribological behavior, were demonstrated and discussed.



Biography

Fan-Bean Wu, Ph.D, graduated from Department of Materials Science and Engineering of National Tsing Hua University, Taiwan, in 2002. He has been recognized as a dedicated researcher in hard protective coating and specialty glass fields. As a faculty in Department of Materials Science and Engineering in National United University, Taiwan, and a society member in both Committees of Taiwan Association of Coatings and Thin Films, TACT, and Taiwan Ceramics Society, TCS, he has served as department chairperson, director of Editing committee, and vice-director of Member committee and received Awards of Outstanding Teaching, Outstanding Service, several research conferences and innovation expos. He welcomes all kinds of research collaboration and is willing to put efforts on developments in any interesting topics concerning coatings/surface technology/glass/material process technologies.

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