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Synthesis and Properties of CrAlSiN Coatings Using a Hybrid HIPIMS+/CMS Technology

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As a variation of high power impulse magnetron sputtering (HIPIMS) technique, HIPIMS+ technology is utilizing Modulated Pulse power Supplies (MPP) as cathode power supplies. By increasing the peak cathode current density within the pulse, one can obtain a high degree of ionization of the sputtered material with low ion energies, while at the same time achieving reasonable deposition rate. The HIPIMS+ technique can be utilized to obtain dense coatings with high hardness and low-level residual stress. These characteristics make the HIPIMS+ technology desirable in synthesizing hard coatings. By combining the conventional magnetron sputtering (CMS), the hybrid HIPMS+/CMS technique is easily to be used for synthesizing multicomponent hard coatings.
Chromium based hard coatings, such as CrN, Cr-Al-N and Cr-Si-N coatings have been widely used as a protective coating owing to their high hardness, low friction coefficient, good corrosion and oxidation resistance under severe environmental conditions. Recently, the quaternary Cr-Al-Si-N coatings were attracting more and more attentions due to their various hybrid functions, such as super hardness (≥50 GPa) and excellent oxidation and wear resistance.
In this presentation, we synthesize the CrAlSiN coatings by reactive sputtering Cr and AlSi targets in an Ar/N_2 atmosphere. A HIPIMS+ power and a conventional pulsed DC power were used as the power supply for Cr and AlSi target, respectively. The influence of chemical composition on the microstructure, mechanical and oxidation properties of the coatings was investigated.

Keywords
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