

Thermal property evaluation of V-Nb-Mo-Ta-W and V-Nb-Mo-Ta-W-B-C high-entropy alloy thin films

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ABSTRACT

Refractory high entropy alloys (HEAs) have drawn lots of attentions from researchers and industries because of their outstanding properties, such as high hardness, good wear resistance, and good corrosion resistance and stable thermal properties. In this work, the V-Nb-Mo-Ta-W and carbon contained V-Nb-Mo-Ta-W-B-C refractory HEA thin films were fabricated by a sputtering system on the Al₂O₃, AISI304 stainless steel, AISI420 stainless steel and P-type (100) Si wafers substrates. The structures of thin films were determined by an X-ray diffractometer. The cross-sectional morphologies of thin films were examined by a field emission scanning electron microscopy (FE-SEM). A nanoindenter and scratch test were used to evaluate the hardness and adhesion properties of thin films, respectively. The thermal properties of the V-Nb-Mo-Ta-W and V-Nb-Mo-Ta-W-B-C coatings were evaluated at the temperature ranging from 500 to 1000 °C. The influence of carbon contents on the thermal stability of the V-Nb-Mo-Ta-W and V-Nb-Mo-Ta-W-B-C coatings were discussed in this study.

Keywords: refractory high entropy alloy thin film, V-Nb-Mo-Ta-W, V-Nb-Mo-Ta-W-B-C, hardness, adhesion, thermal stability