

Effects of cathodic arc ion plated CrN and CrAlN coatings on tensile and fatigue performances of H13 steel

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Abstract

Surface coating played a role of material mechanical property, CrN and CrAlN coatings were deposited on H13 steel to improve its tension and fatigue performances. The morphologies, phases and nanomechanical properties of obtained coatings were analyzed using a scanning electron microscope (SEM), X-ray diffraction (XRD), and nanoindentation tester, respectively. The effects of CrN and CrAlN coatings on the tensile and fracture performances of H13 steel were investigated by tensile and fatigue tests, and the fracture morphologies were observed to analyze the fracture mechanism. The results show that the CrN and CrAlN coatings improve the tensile properties of H13 steel, the area work of CrAlN coated sample is the largest among the three kinds of samples. The fatigue life of CrN and CrAlN coated samples is 1.52×10^5 and 1.70×10^5 , respectively, higher 1.01×10^5 than the uncoated sample, the CrN and CrAlN coatings enhance the fatigue life of substrate. The crack initiation and propagation of coated samples are suppressed by the coatings with the high hardness and elastic modulus, which improve their fatigue performances.

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