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CrTiAlCN多元多层梯度膜的制备及其结构

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摘要: 采用中频反应磁控溅射、离子束辅助方法沉积CrTiAlCN多元硬质薄膜, 利用扫描电镜、俄歇电子谱、透射电镜及X射线衍射等技术对膜层的过渡层、界面及微观结构进行研究。结果表明: 沉积制备的膜层为多层梯度过渡结构, 成分深度分布及相结构分析证实, 所制备的多元多层梯度膜与所设计的基体/Cr/CrN/CrTiAlN/CrTiAlCN结构相吻合; 在梯度过渡中, 不同层之间界面体现为渐变过渡过程; 沉积制备的多元多层梯度膜硬度高达26.31 GPa, 膜/基结合力大于80 N, 摩擦因数低至0.113, 力学性能优良。

关键字: CrTiAlCN薄膜; 磁控溅射; 离子束辅助

Growth and microstructure of CrTiAlCN multi-composite thin films

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Abstract: CrTiAlCN multi-composite hard films were deposited by ion beam assisted reactive mid-frequency magnetron sputtering. Auger electron spectroscopy, transmission electron microscopy, X-ray diffractometry and microhardness tester were used to investigate the interface, interlayer, microstructure and composition of the multi-composite hard films. The results show that the multi-composite hard films contain multilayer gradient structure that coincides with the designed structure of substrate/Cr/CrN/CrTiAlN/CrTiAlCN, the composition distribution changes gradually between the interface in interlayer. The hard films exhibit good comprehensive performance with micro-hardness of 26.31 GPa, adhesion strength of 80 N and friction coefficient of 0.113.

Key words: CrTiAlCN; thin films; unbalanced magnetron sputtering; ion beam assistance

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