

研究论文

磁场非平衡度对CrNx镀层性能的影响

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摘要: 使用具有不同非平衡度的磁控管直流磁控溅射技术沉积CrNx镀层, 并用Langmuir探针诊断、高斯仪测量、Ansys软件模拟等手段进行表征, 研究了磁场非平衡度对溅射等离子体的空间分布状态以及CrNx镀层的微观结构、硬度及摩擦性能的影响。结果表明: 低非平衡度磁控管(K为2.78)将多数离子束缚在靶材表面大约6 cm范围内, 而对于高非平衡度磁控管(K为6.41)则在此区域没有类似的高密度等离子体存在。随着磁场非平衡度的增大, CrNx镀层的厚度递增, 物相结构也从Cr+Cr2N依次向Cr+Cr2N+CrN和Cr2N+CrN转化, 且镀层的平整度和致密性随之明显改善。同时, CrNx镀层的硬度随着非平衡度的增大而提高, 摩擦系数则随之减小。

关键词: 无机非金属材料 CrNx镀层 非平衡度 离子轰击

Influence of Magnetic Field Unbalance Coefficient on Properties of CrNx Coatings

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Abstract: CrNx coatings deposited by using different unbalance coefficient magnetron by DC magnetron sputtering system, were characterized. The influences of the magnetic field unbalance coefficient on the distribution of sputtered plasma and microstructure, hardness and tribological properties of CrNx coatings were investigated. The results show that multitude ions were tied near the target surface within 6 cm rang when using low unbalance coefficient magnetron (K was 2.78), but similar high density plasma does not existed at this area when using higher unbalance coefficient magnetron (K was 6.41). The thickness of CrNxcoatings increases with unbalance coefficient increases. The phase structure of the CrNx coatings deposited in three unbalanced magnetic field transformed from Cr+Cr2N to Cr+Cr2N+CrN→Cr2N+CrN with the increase of unbalance coefficient. With unbalance coefficient increasing, the flatness and compactness of the coatings were improved obviously, and the hardness was enhanced and friction coefficients were decreased.

Keywords: inorganic non-metallic materials CrNx coating unbalance coefficient ion bombardment

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