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钽等离子体渗氮的表面过程分析

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摘要: 对钽表面渗氮的固-气界面反应过程进行了热力学和动力学分析, 从理论上预测了各种参数(压力、气体组成、温度、电参数等)对表面过程的影响, 并借助于等离子体, 在较低温度下获得了由表面层与N在Ta中的固溶体组成的表面硬化层。表面层为六方晶系的 $Ta_6N_{2.57}$ 和/或非晶态。通过调整工艺参数有效地抑制了钽表面氧的渗入和 Ta_2O_5 的形成, 使得离子渗氮后, 仍保持较低的表面粗糙度。

关键字: 钽; 离子渗氮; 表面过程

Analysis of interface reactions during plasma nitriding of tantalum

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Abstract: The reaction process on the surface of solid-gases during nitriding of tantalum was discussed thermodynamically and dynamically. The effects of technical parameters such as pressure, temperature, electrical current density and voltage on the surface process were analyzed theoretically. The nitriding layers on tantalum surfaces with high hardness and better roughness were obtained with the help of plasma at low temperature. The layers were composed of the solid solution of tantalum and surface layers, which are amorphous phase or/and compound $Ta_6N_{2.57}$.

Key words: tantalum; ion-nitriding; surface process

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