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电沉积Cr/ZrO_2复合镀层的结构和摩擦性能

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摘 要：采用复合电沉积工艺制备Cr/ZrO_2纳米复合镀层，分别用扫描电子显微镜(SEM)、扫描电子显微镜附带能谱仪(EDS)、X线衍射(XRD)等技术较系统地研究了Cr/ZrO_2纳米复合镀层的表面形貌、成分、结构和耐磨性。研究结果表明：复合镀层的中ZrO_2的复合量质量分数为1.47%，在ZrO_2纳米粒子的弥散强化作用下，Cr/ZrO_2复合镀层无裂纹，组织致密，结构呈现明显的非晶态特征；在干摩擦条件下，纳米Cr/ZrO_2复合镀层的摩擦性能明显优于3价铬镀层的摩擦性能；纳米Cr/ZrO_2复合镀层的磨损主要表现为疲劳磨损特征，而3价铬镀层的磨损机制为磨料磨损。

关键字：电沉积；纳米复合镀层；非晶态；耐磨性

Structure and friction behavior of electrodeposited Cr/ZrO_2

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Abstract: New Cr/ZrO_2 nano-composite layers were prepared by composite electrodeposition technology. The morphology, composition, structure and friction resistance properties of the coatings were systematically characterized by means of SEM, EDS, X-ray diffraction and potentiostat methods. The worn surfaces of Cr coatings and Cr matrix composite coatings, were analyzed with a SEM and XPS. The results show that the mass composition of the obtained ZrO_2 composite coating is 1.47%, the crack condition of Cr coatings is improved markedly by the dispersion strengthening effect of the ZrO_2 nano-particle. Meanwhile, the composite coatings present an obvious amorphous characteristics, compact structure, and uniform composition. The friction and wear properties of the composite coatings is investigated using a pin-on-disc sliding wear machine under dry friction conditions. In comparison with Cr coatings, the friction resistance of the composite coatings is higher, the wear mechanism of nanometer ZrO_2

particles reinforced Cr matrix composite coating is characterized by slight fatigue wear， while that of trivalent Cr coating is characteristic of abrasive wear.

Key words:electrodeposition; nano-composite coating; amorphous; friction resistance