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钛合金表面等离子喷涂Y₂O₃稳定的ZrO₂涂层的 扫描热显微镜分析

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摘要:以纳米结构Y₂O₃稳定的ZrO₂热喷涂粉末为原料,采用等离子喷涂法在Ti-6Al-4V合金上制备了纳米结构的热障涂层。利用扫描电镜(SEM)及扫描热显微镜(SThM)对涂层的微观组织及热性能进行了分析。在实验基础上建立了理论模型,并对涂层及基体的热导率进行了估算。结果表明:采用SThM分析方法估算的涂层厚度及涂层上的缺陷尺寸与采用其它分析方法测得的结果一致;虽然热导率的估算结果与采用其它方法得出的结果差异较大,但显示出扫描热显微镜分析是估算材料热导率潜在的方法。

关键字: 氧化钇; 氧化锆涂层; 等离子喷涂; 扫描热显微镜; 热导率

Thermal properties of plasma-sprayed yttria-stabilized zirconia thermal barrier coating on Ti-6Al-4V alloy analyzed by scanning thermal microscopy

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Abstract: Using nano-structure yttria-stabilized ZrO₂ powder, yttria-stabilized zirconia coatings were deposited on Ti-6Al-4V substrate by plasma spraying. The microstructure and thermal properties of the as-sprayed coating were characterized by scanning electronic microscopy (SEM) and scanning thermal microscopy (SThM). The analyses show that, the thickness and dimensions of the defects in coatings estimated by this method are in good agreement with those obtained using other analysis methods. Based on the experiments, the thermal probe was calibrated and thermal conductivities of the coating and substrate

were estimated. The results and thermal conductivity estimation demonstrate that SThM analyses can be used as a potential tool for the thermal property and microstructure analysis of plasma-sprayed thermal barrier coating.

Key words: yttria; zirconia coating; plasma spraying; scanning thermal microscopy; thermal conductivity

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