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激光熔覆纳米Al_2O_3等离子喷涂陶瓷涂层

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摘 要： 采用X射线衍射仪、 扫描电镜和显微硬度计研究了45#钢表面激光熔覆纳米Al_2O_3改性Al_2O_3+13%TiO_2（质量分数）陶瓷涂层的相组成、微观结构和显微硬度， 同时对涂层的磨损特性进行了考察。 结果表明， 激光重熔区亚稳相γ-Al_2O_3转变成稳定相α-Al_2O_3， 熔覆层由粗颗粒α-Al_2O_3和TiO_2以及纳米α-Al_2O颗粒组成， 在激光的作用下， 等离子喷涂层的片层状结构得以消除；纳米Al_2O_3颗粒仍然保持在纳米尺度，填充在涂层的大颗粒之间， 使涂层致密化程度得以提高， 因此纳米Al_2O_3改性涂层的显微硬度较高，且其耐磨性能明显优于等离子喷涂层。

关键字： 纳米Al_2O_3颗粒； Al_2O_3； TiO_2； 等离子喷涂；复合陶瓷涂层； 激光熔覆

Plasma-sprayed ceramic coating by laser cladding of Al_2O_3 nano-particles

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Abstract: The phase constitution, microstructure and microhardness of Al_2O_3+13%TiO_2(mass fraction) composite ceramic coatings laser-cladded by Al_2O_3 nano-particles on 45# steel were investigated using X-ray diffractometry, scanning electron microscopy and microhardness measurement. Also, wear behavior of the coatings was studied. The results show that the metastable γ-Al_2O_3 phases in the cladding area transfer into stable phase of α-Al_2O_3, composite ceramic coating consists of α-Al_2O_3 and TiO_2, and lamellar structure of plasma-sprayed coatings is eliminated after the laser-cladding. A large number of Al_2O_3 nano-particles are found among the large particles of the ceramic coating and play an important role in improving the density of the ceramic coating. So laser-cladded nano-Al_2O_3 ceramic coating has higher hardness and better wear resistance than plasma sprayed Al_2O_3+13%TiO_2 coating does.

Key words: Al_2O_3 nano-particle; alumina; titania; plasma spraying; composite ceramic coating; laser cladding

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