

沉积温度对CVD SiC涂层显微结构的影响

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摘要 以MTS为先驱体原料, 在950~1300℃、负压条件下沉积了CVD SiC涂层. 利用SEM对涂层的表面形貌和断面特征进行了表征. 沉积温度和SiC涂层表面形貌的关系如下: 950℃时, 沉积的SiC颗粒非常细小, 为独立的球形堆积; 1000~1100℃时, CVD SiC涂层表面光滑、致密; 1150~1300℃沉积的SiC涂层呈现出球状或瘤状结构且表面粗糙. 结合热力学和晶体形核-长大理论, 研究了沉积温度对SiC涂层表面形貌的作用机制. 沉积温度和SiC涂层断面形貌的关系如下: 1200℃以下沉积的SiC涂层断面致密、无孔洞; 而1300℃沉积的SiC涂层断面非常疏松.

利用岛状生长模型揭示了SiC涂层内部显微结构的形成机理.

关键词 [化学气相沉积](#) [SiC](#) [温度](#) [涂层](#) [显微结构](#)

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Effects of Deposition Temperature on the Microstructures of SiC Coatings by CVD

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Abstract The coatings of SiC were prepared from the methyltrichlorosilane (MTS) by low pressure chemical vapor deposition from 950℃ to 1300℃. SEM was used to characterize the surface and cross-sectional morphologies of the as-deposited coatings. The effects of temperature on the microstructures of SiC coatings were investigated. At 950℃, the as-deposited SiC coating is loose and the grains of the coating are fine. In the temperature range of 1000-1100℃, CVD SiC coatings show a dense and smooth surface morphology. However, in the temperature range of 1150-1300℃, the surface morphology of SiC coatings changes to rounded hillocks and the as-deposited coatings are very rough. Factors influencing the surface morphologies and structures of SiC coatings were studied through thermodynamics and nucleation-growth theory. The relationship between deposition temperature and SiC coatings' cross-sectional morphologies can be listed as follows, the as deposited coatings are very dense and there are no holes when the deposition temperature is lower than 1200℃, however, the as deposited coatings become very loose at 1300℃. The inside structures of SiC coatings were interpreted by the island growth model.

Key words [chemical vapor deposition](#) [SiC](#) [temperature](#) [coatings](#) [microstructure](#)

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