

Si-TaSi₂共晶自生复合场发射材料的定向凝固组织特征

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摘要 采用电子束悬浮区熔装置(EBFZM)制备了Si-TaSi₂共晶自生复合场发射材料,系统地研究了Si-TaSi₂共晶的定向凝固组织特征.当凝固速率在0.3~9.0mm/min范围内变化时,均可获得Si-TaSi₂共晶自生复合材料,具有高精确取向的TaSi₂纤维在硅连续基体中均匀分布.随着凝固速率的增大,TaSi₂纤维的直径和平均间距减小,面密度和体积分数增大.采用零功率法考察了不同凝固速率时的固-液界面形貌.当凝固速率由0.3mm/min变化到5.0mm/min时,固-液界面经历了平界面→浅胞状界面→胞状界面→平界面的演化过程.

关键词 [定向凝固](#) [电子束悬浮区熔](#) [Si-TaSi₂共晶自生复合材料](#) [固-液界面](#)

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Microstructures of Directionally Solidified Si-TaSi₂ Eutectic *in situ* Composite for Field Emission

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Abstract The directionally solidified Si-TaSi₂ eutectic *in situ* composite for field emission was prepared with the electron beam floating zone melting (EBFZM) technique. The microstructure characteristic of Si-TaSi₂ eutectic was systematically investigated. The Si-TaSi₂ eutectic *in situ* composite, which has high-aligned and uniformly-distributed TaSi₂ fibers in the Si matrix, can be obtained when the solidification rate changes from 0.3mm/min to 9.0mm/min. With the increase of the solidification rate, the diameter and the inter-rod spacing of the TaSi₂ fibers are decreased, while the density and the volume fraction of the fibers are increased. The solid/liquid interface is studied by the zero power method as well. When the solidification rate varies from 0.3mm/min to 5.0 mm/min, the solid/liquid interface morphology has the following evolution processing: planar interface→shallow cell interface→cell interface→planar interface.

Key words

[directional solidification](#) [electron beam floating zone melting](#) [Si-TaSi₂ eutectic *in situ* composite](#) [solid/liquid interface](#)

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