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SCR技术制备Al-5Ti-0.25C合金的组织演化

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摘要: 利用SCR成形技术, 使液固反应法获得的Al-5Ti-0.25C合金在强剪切应力场中凝固成形, 制备了高细化活性的Al-Ti-C晶粒细化剂, 对纯Al细化时其晶粒尺寸小于80 μm 。研究了SCR成形合金的微观结构及其形成机制。结果表明: SCR成形过程中合金熔体受到强烈剪切与热扰动作用, 影响了自由晶TiC的迁移行为及TiAl₃的溶解析出, 从而改变了Al-5Ti-0.25C合金的组织形态: TiC粒子呈弥散分布以及与TiAl₃形成二重粒子均能显著提高TiC粒子的形核能力。

关键词: SCR成形; Al-5Ti-0.25C合金; 弥散分布; 二重粒子; 形核能力

Microstructure evolution of Al-5Ti-0.25C alloy formed by SCR technique

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Abstract: The SCR (shear-cooling roll) technique was used to solidify dynamically and form directly from the melt of Al-5Ti-0.25C alloy to prepare Al-Ti-C grain refiners with high activity of refinement, with average grain size 80 μm in refining pure aluminum. The microstructure of SCR formed alloy and its formation mechanism were studied experimentally. It is shown that the strong shearing and heat disturbance action of SCR forming process on alloy melt affect the behavior of migration of free crystal TiC and the dissolution and precipitation of TiAl₃ and thus change the microstructural morphology of Al-5Ti-0.25C alloy. The dispersive distribution of TiC particles inside $\alpha(\text{Al})$ and the formation of duplex particles of TiC particles with TiAl₃ can improve significantly the capability of nucleation of TiC particles.

Key words: SCR forming; Al-5Ti-0.25C alloy; dispersive distribution; duplex particles; capability of nucleation

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