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Growth rate affecting eutectic spacings in directionally solidified Al-12.6wt.%Si alloy

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It is well known that more than 50% of the non-ferrous cast alloys used by industrial sector has aluminum in its nominal composition as well as that the alloys of the Al-Si system represent approximately 90% of all cast aluminum products. In this sense, this work aims to investigate the effect of growth rate (VE) on eutectic spacings (λ_E) in a directionally solidified Al-12.6wt%Si eutectic alloy and for this purpose an upward solidification device was used. On the other hand, optical microscopy techniques were applied to characterize the as-cast microstructure and the eutectic Si spacing was measured and correlated with the eutectic isotherm growth rate (VE). A mathematical expression given by $\lambda_E = \text{Constant} \cdot (V_E)^n$ is proposed to characterize the λ_E variation as a function of the growth rate. It was found that the λ_E values decreased with the increase of VE and that the exponent n obtained value showed a good agreement with the proposed value by the classical theory of eutectic growth developed by Jackson and Hunt, that is, $\lambda_E \sim V_E^{-1/2}$.