Model Equations

The model is based on a previous stochastic model by Guillemot et al. (2006) using CA technique to simulate grain growth, nucleation and movement effects on as-cast structure. In this work, macroscopic equations are replaced by thermal interpolation from experimental data. In order to calculate internal solid fraction, an expression can be deducted from general average equations to account cooling, growth and solute diffusion from the grain to extradendritic liquid. Average interdendritic solute concentration is assumed in equilibrium with the average temperature of the grain. The expression is:



with  as the internal solid fraction of the grain;  is the average solute concentration of the grain;  is the solute partition coefficient;  is the phase density;  is the interfacial area of the grain;  is the volume of the grain;  is the volume equivalent radius;  is the liquid diffusion coefficient;  is the solute diffusion length.

Geometric parameters of the grain such as volume, interfacial area and equivalent radius are obtained by assuming an equivalent regular octahedron as showed in the work of Guillemot. The equivalent radius growth velocity is calculated by averaging dendritic growth velocity

Resultados

Referências