

Full field modeling of austenite grain growth using the level set method

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ABSTRACT

Microstructural modeling plays a crucial role in reducing experimental workload and accelerating the development of advanced materials. Among the various modeling approaches, full-field models have gained significant attention due to their ability to more accurately represent metallurgical phenomena across a broader range of conditions. This study focuses on the investigation of pure grain growth in polycrystalline material with an initial lognormal grain size distribution. The DIGIMU® software, which employs the level-set method, is utilized to simulate grain growth. To calibrate and validate the model, heat treatment experiments were conducted at temperatures of 1150°C, 1175°C, 1200°C, and 1260°C, with holding times ranging from 5 to 25 minutes. The results demonstrate that the level-set method provides an accurate prediction of grain size evolution, showing good agreement with experimental measurements, with a difference between experimental and simulated results ranging from 1.4% to 4.9%.