Formation Dynamics of Layered Microstructures upon Quenching of Spherical Steel

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Abstract

The fraction and the locus of the micro-structural phases during the quench setup of the austenite steel critically determines its physical and mechanical properties. Starting from our experimental results on the quench rate, we develop a dynamic framework for predicting the evolution of the phase boundaries and their marginal variations in spherical steel. Such real-time development requires the tracking of the temperature rate as a determining factor for the formation of the specified phases. Our parametric analysis predicts the role of the quench temperature, scale (i.e. radius) of the spherical steel and the initial temperature and predicts the threshold, where one or two of the phases cease to exist. The model could get utilized for the designing the quench parameters to obtain the desired mechanical properties from the original austenite phase.

Keywords: Quench, Phase Formation, Cooling Rate, Real-time Analysis.

1 Introduction

The quenching of the steel is a highly sensitive phenomenon, where the small variation in the initial parameters (i.e. temperature, scale) can vastly tweak the amount of the resulted microstructures and

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