

Effect of Plastic Deformation on the Carbide-Free Bainite Transformation in Medium C-Si Steel

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Abstract : In this study, the influence of pre-strained austenite on the extent of isothermal bainite transformation in medium-carbon, high-silicon steel was investigated. Different amounts of deformations were applied at 600°C on the austenite right before quenching to the region, where isothermal bainitic transformation is activated. Four different temperatures of 325, 350, 375, and 400°C considering similar holding time 1800s at each temperature, were selected to investigate the extent of isothermal bainitic transformation. The results showed that the deformation-free austenite transforms to the higher volume fraction of CFB bainite when the isothermal transformation temperature reduced from 400 to 325°C, the introduction of plastic deformation in austenite prior to the formation of bainite invariably involves a delay of the same or identical isothermal treatment. On the other side, when the isothermal transformation temperature and deformation increases, the volume fraction and the plate thickness of bainite decreases and the amount of retained austenite increases. The shape of retained austenite is mostly representing blocky-shape one due to the less amount of transformed bainite. Moreover, the plate-like shape bainite cannot be resolved when the deformation amount reached 30%, and the isothermal transformation temperatures are of 375 and 400°C. The amount of retained austenite and the percentage of its transformation to martensite during the final cooling stage play a significant role in the variation of hardness level for different thermomechanical regimes.

Keywords : ausforming, carbide free bainite, dilatometry, microstructure

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