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Low Temperature Bainite: An Analysis at Atomic Level

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Atom probe tomography and field ion microscopy have been used to study bainite transformation at a very low temperature (200 °C). Compositional analysis of the retained austenite and bainitic ferrite have been performed. The carbon concentration in the bainitic ferrite was found to be higher than expected from paraequilibrium between austenite and ferrite. Atom probe tomography revealed that a substantial quantity of carbon was trapped at dislocation in the vicinity of the ferrite/austenite interface. In addition, the extent of substitutional alloying element distribution across the bainitic ferrite/austenite interface was examined as a function of isothermal transformation time at 200°C. These results can be explained in terms of the diffusionless growth of bainite sub-units.