Atom Probe Analysis of Carbon Distribution in a Bainitic High-Strength Steel

M. Peet[*], S. S. Babu[†], M. K. Miller[†] and H. K. D. H. Bhadeshia[*]

[*]*Department of Materials Science and Metallurgy, University of Cambridge, Pembroke Street, Cambridge, United Kingdom*

[†]*Metals and Ceramics Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831, United States of America*

An energy compensated optical position sensitive atom probe was used to analyze the nanoscale distribution of carbon and other substitutional solutes in a low temperature bainitic microstructure consisting of a mixture of bainitic ferrite plates in a retained austenite matrix. Atom probe microanalysis showed a wide distribution of carbon concentrations in both ferrite and austenite. The ferrite carbon concentrations are higher than the expected paraequilibrium solubility levels and the austenite carbon concentration is found to be slightly higher than the T_0 limit. The results are consistent with previous atom-probe data on low carbon steels and confirm X-ray data, which indicated excess carbon in bainitic ferrite.

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