Effect of Nb on Ferrite Recrystallization and Austenite Decomposition in Microalloyed Steels

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A promising new method for steel design is based on controlling alloy chemistry and thermo-mechanical processing parameters to tailor microstructural evolution though an explicit understanding of the physical mechanisms governing microstructural change. Additions of Nb have been shown to have a large effect on microstructural processes in steels and this contribution summarizes recent work on elucidating the effect of Nb on the processes of recrystallization in ferrite and the kinetics of the austenite to ferrite phase transformation. In particular, emphasis is placed on distinguishing the effects of Nb in solution and Nb present as Nb-containing precipitates. Nb in solution is shown to have a very strong effect on the recrystallization in ferrite and this can be quantified and understood in terms of the well-known solute-drag effect. The effect of NbC particles on the kinetics of the austenite to ferrite phase transformation is, however, less clear. Theoretical considerations would lead us to expect interphase boundary carbide precipitation to influence the transformation rate but novel decarburization experiments suggest this is not the case. This illustrates that although we are making progress on our understanding of the physical mechanisms governing change in Nb containing steels, there remains a number of important issues requiring further work.

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