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# Mutual Mechanical Effects of Ferrite and Martensite in a Low Alloy Ferrite-Martensite Dual Phase Steel

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## Abstract

In this paper micromechanical behavior of ferrite and martensite microphases was evaluated by means of comprehensive micro- nanohardness measurements supplemented by light and electron microscopies and wavelength-dispersive spectroscopy (WDS). Experimental results indicated that not only ferrite but martensite hardening behavior was significantly influenced by ferrite and martensite volume fractions in dual phase (DP) microstructures. Ferrite hardness was continuously diminished with increasing ferrite volume fraction whereas the martensite hardening was increased with increasing ferrite volume fraction and then it did not varied in line with further progress in ferrite transformation and relevant carbon enrichment of prior austenite. In addition to these unexpected ferrite and martensite hardening variations, the lower hardness of martensite in DP microstructures in comparison to that of martensite in full martensitic microstructure cannot be completely interpreted by carbon alloying effects. These results are rationalized to the introduction of mobile dislocations into prior austenite due to plastically accommodation of martensitic transformation strains by prior austenite areas during quenching and the influence that formation of ferrite would have on this hardening mechanism.

**Keywords:** ferrite-martensite dual-phase microstructure; microhardness; nanoindentation; EPMA-WDS; hardening response