

**The Effect of Stress on the Widmanstätten Ferrite Transformation**

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**Abstract**

Transformation of Widmanstätten ferrite has been considered to be displacive with a large shear component (larger than martensite and bainite). It is expected that the external stress exerts a profound effect on Widmanstätten ferrite formation. Optical metallographs show that under the influence of an applied compressive stress (below the yield strength of austenite) the number of crystallographic variants of Widmanstätten ferrite is reduced drastically and there is a strong tendency for the plates that do grow to align. Transformation strains (including longitudinal and radial strains) during Widmanstätten ferrite formation are shown to be consistent with the microstructural changes. Furthermore, transmission electron micrographs clearly reveal that the applied stress leads to the decoupling of the adjacent accommodating plates of Widmanstätten ferrite. All the experimental results are explained in terms of the invariant-plane-strain displacive mechanism for Widmanstätten ferrite.