

Functional Gradation of Low Alloy Steel by Differentially Controlled Phase Transformation

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In the present study, the phase transformation behaviour of 51CrV4 steel was investigated both in an actual flange forming process and under idealized isothermal bainitic transformation conditions. The results demonstrated that superimposed external stresses have only a minor effect on the kinetics of the phase transformation, whereas strains resulting from transformation plasticity were significant. Transmission electron microscopy revealed a preferential alignment of the bainite with respect to the external loading direction. This selection of favourably oriented variants in turn causes macroscopic strains. Understanding and minimizing these strains are a key factor in designing functionally graded components with minimum distortion.

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