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Effect of Plastic Pre-straining on Residual Stress and Composition Profiles in Low-Temperature Surface-Hardened Austenitic Stainless Steel - DTU Orbit (09/11/2017)

Effect of Plastic Pre-straining on Residual Stress and Composition Profiles in Low-Temperature Surface-Hardened Austenitic Stainless Steel

The present work deals with the evaluation of the residual stress profiles in expanded austenite by applying grazing incidence X-ray diffraction (GI-XRD) combined with successive sublayer removal. Annealed and deformed (εeq=0.5) samples of stable stainless steel EN 1.4369 were nitrided or nitrocarburized. The residual stress profiles resulting from the thermochemical low-temperature surface treatment were measured. The results indicate high-residual compressive stresses of several GPa's in the nitrided region, while lower-compressive stresses are produced in the carburized case. Plastic deformation in the steel prior to thermochemical treatment has a hardly measurable influence on the nitrogen-rich zone, while it has a measurable effect on the stresses and depth of the carbon-rich zone.

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