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The Effect of Material Properties and Volumetric Changes in Phase Transformation to the Final Residual Stress of Welding Process

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Abstract : The wider growing Finite Element Method (FEM) application is caused by its benefits of cost saving and environment friendly. Also, by using FEM a deep understanding of certain phenomenon can be achieved. This paper observed the role of material properties and volumetric change when Solid State Phase Transformation (SSPT) takes place in residual stress formation due to a welding process of ferritic steels through coupled Thermo-Metallurgy-Mechanical (TMM) analysis. The correctness of FEM residual stress prediction was validated by experiment. From parametric study of the FEM model, it can be concluded that the material properties change tend to over-predicts residual stress in the weld center whilst volumetric change tend to underestimates it. The best final result is the compromise of both by incorporates them in the model which has a better result compared to a model without SSPT.

Keywords : residual stress, ferritic steels, SSPT, coupled-TMM
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