

Delamination of Scale in a Fe Carbon Steel Surface by Effect of Interface Roughness and Oxide Scale Thickness

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Abstract : Delamination of oxide scale has been often discovered at the interface between Fe carbon steel and oxide scale. Among several mechanisms of this delamination behavior, the normal tensile stress to the substrate-scale interface has been described as one of the main factors. The stress distribution at the interface is also known to be affected by thermal expansion mismatch between substrate and oxide scale, creep behavior during cooling and the geometry of the interface. In this study, stress states near the interface in a Fe carbon steel with oxide scale have been investigated using FE simulations. The thermal and mechanical properties of oxide scales are indicated in literature and Fe carbon steel is measured using tensile testing machine. In particular, the normal and shear stress components developed at the interface during bending are investigated. Preliminary numerical sensitivity analyses are provided to explain the effects of the interface geometry and oxide thickness on the delamination behavior.

Keywords : oxide scale, delamination, Fe analysis, roughness, thickness, stress state

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