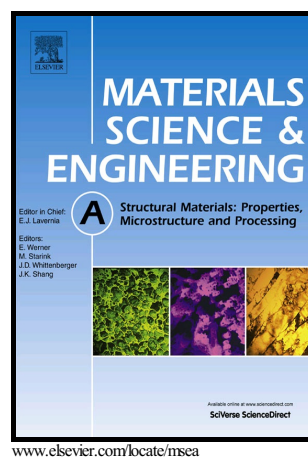


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Effects of untransformed ferrite on Charpy impact toughness in 1.8-GPa-grade hot-press-forming steel sheets

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Abstract

Hot press forming (HPF) steel sheets are austenitized, press-formed, and rapidly cooled to obtain a martensitic microstructure with an ultra-high strength. When they are insufficiently austenitized, their microstructures might contain a small amount of untransformed ferrite, which can deteriorate impact toughness as well as strength, but its causes and relevant fracture mechanisms have not been clearly verified yet. In this study, thus, 1.8-GPa-grade HPF sheets were austenitized at various temperature and time, and their tensile and Charpy impact test results were analyzed in relation with untransformed ferrite and its effect on fracture mechanisms. In the HPF sheets containing the untransformed ferrite, voids were formed mostly at ferrite/martensite interfaces, and were grown and propagated linearly to form a cleavage crack, whereas deformation bands were well developed without voids or cracks in the non-ferrite-containing sheets. The highly localized strains accommodated in the soft ferrite made ferrite/martensite interfaces or ferrite itself work as fracture initiation sites, which led to the

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