

عنوان مقاله:

Deformation of martensite islands and pattern of voids formation in dualphase steel with 2D and 3D stress distribution based on micromechanical experimental observation

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خلاصه مقاله:

A detailed analysis of the microstructure and deformation mechanism of a dual phase (DP) steel material was conducted on specimens with 2D and 3D stress distribution. Accordingly, three tensile tests on 2D specimens and three tensile test on 3D specimens were performed and interrupted at different strain levels in order to investigate void nucleation, martensite islands deformation and the differences between 2D and 3D specimens. Scanning electron microscopy (SEM) and metallography analysis revealed that large elongation in martensite islands and elongated voids occurs by ferrite grain-boundary decohesion in the neighborhood of martensite grains at 2D specimens. Further, void initiation could be observed around the martensite grains. On the other hands, martensite islands and voids sustain different pattern in 3D specimens and the martensite islands shape are not changed severely. 2D or 3D stress distribution has a significant impact on the deformation and voids pattern. The mechanism of failure was found to be influenced by deformation localization due to microstructural inhomogeneity. Based on the experimental observations and simulation results from 2D representative volume element (RVE), a model describing the failure mechanism is proposed for dual-phase steel material.

کلمات کلیدی:

Dual phase steel, SEM images, Martensite deformation, Voids formation

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