Experimental and numerical evaluation on deformation and fracture mechanism of cast duplex stainless steel tubular specimen

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Abstract

Deformation behavior and fracture mechanism of cast duplex stainless steels tubular specimen under different tensile stages were investigated through experimental and numerical evaluation. The results showed that the axial stress was redistributed due to the necking of the tubular specimen, and the axial stress near the internal wall was larger than those near the external wall and its maximum axial stress was distributed between the internal wall and the center of wall thickness. Microcracks and voids were initiated under the maximum shear stress along the δ/γ phase interface, and propagated to the ferrite interior. The voids were connected and merged into the main crack through the propagation of the microcracks. Moreover, the main crack first propagated to the internal wall and then rapidly propagated to the external wall. The fracture morphology can be divided into three types: shear lip zones can be both found on the internal and external walls, shear lip zones can be found only on the internal wall or only on the external wall.

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