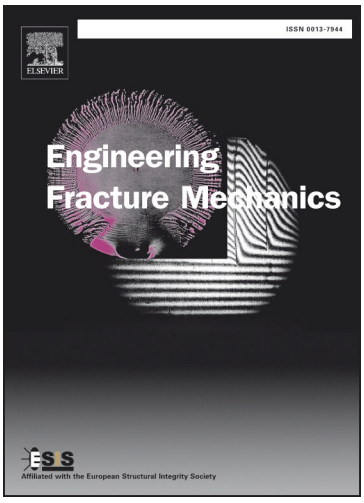

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Pit to crack transition behavior in proportional and non-proportional multiaxial corrosion fatigue of 304 stainless steel

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Abstract

Corrosion fatigue tests with interruption were carried out on 304 stainless steel in 6 wt.% $FeCl_3$ solution at room temperature under cyclic tension-torsion loading. Pit initiation, growth and pit to crack transition behavior under proportional and non-proportional loading were investigated by microscopic measurement and Finite Element Analysis (FEA). Under proportional loading, significant sharper pits, higher initial pit density and growth rate were observed in comparison with non-proportional loading. The pit depth growth rate under proportional loading was larger than those under non-proportional loading and without loading. The direction of principal stress plane under multiaxial cyclic loading strongly dominated the pit initiation and growth kinetics. Pit to crack transition was mainly controlled by interaction between cyclic principal stress and local dissolution under proportional loading while additional hardening under non-proportional loading.

Keywords: Corrosion fatigue, Multiaxial fatigue, Pitting corrosion, Crack formation

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