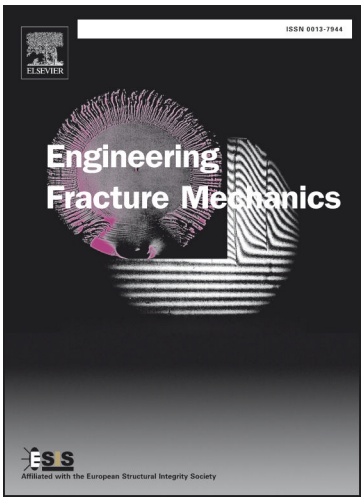

Evaluation of fracture toughness in different regions of weld joints using unloading compliance and normalization method

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Evaluation of fracture toughness in different regions of weld joints using unloading compliance and normalization method

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Abstract: Both unloading compliance method and normalization method specified in ASTM E1820-16 were conducted on the API 5L X70 and X80 pipeline steels. Extensive experimental measures of fracture toughness for different regions of weld joints were carried out. For comparison, the *J–R* curves and initiation fracture toughness determined using the normalization method are compared with those obtained by the elastic unloading compliance method for two different weld joints. The results show that good agreements exist between the two methods, and an average difference less than 10% is detected. Moreover, the comparison indicates that the *J–R* curves from the unloading compliance method are lower at the initial stage of crack extension, and as the crack grows, the *J–R* curves are higher compared with those of the normalization method. For different regions in weld joints, there is clear distinction of differences between the corresponding results from above two methods. A ductile brittle mixed fracture mechanism is found in weld metal and coarse grained heat affected zone, and a corresponding higher deviation is detected.

Key Words fracture testing; normalization method; unloading compliance method; *J-R* curves; weld joints.