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Hydrogen and Temper Embrittlement Effects on Fatigue Fracture Behaviour of 2.25Cr-1Mo Nuclear Reactor Pressure Vessel Steel

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Nuclear reactor pressure vessel is a critical component of any nuclear power plant. The vessel is a thick wall container that withstands internal pressure caused by the reactor activity. This also plays important role to provide necessary barrier to keep radioactive materials out of the environment. Considering the functions, high strength low steel is usually proper candidate for making the vessel. However, reactor operation generates subatomic particle neutron under operation causing embrittlement and degradation of the steel vessel. Another source of degradation of the pressure vessel steel is by temper embrittlement due to its exposure at high temperature. Hydrogen embrittlement further deteriorates the situation. In this research work, the effect of hydrogen embrittlement on the fatigue crack growth behaviour of 2.25Cr-1.0Mo pressure vessel steel before and after temper embrittlement has been studied. Experimental results revealed that both hydrogen embrittlement and temper embrittlement contribute in enhancing crack growth and also in changing the fracture morphology.

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