Contribution ID: **782** Type: **not specified**

P2.211 Fatigue characterization and modeling of CLAM steel under multi-axial non-proportional cycle loading

Tuesday, 18 September 2018 11:00 (2 hours)

Due to the low activation and excellent neutron irradiation resistance, the Reduced Activation Ferritic/Martensitic (RAFM) steel has been considered as the primary candidate structural material for the blanket of the first fusion reactor plant. The rigorous serving condition of a fusion reactor lead to to multiaxial stress-strain condition of the blanket. With the multiaxial cyclic loading, the RAFM steel possesses additional hardening effect which will deteriorate the material performance.
In this work, multiaxial fatigue tests were conducted on China Low Activation Martensitic (CLAM) steel under proportional and non-proportional loading. Additional hardening was observed under non-proportional loading condition. Under torsion loading, large numbers of early micro cracks emanated from the sample's surface, and a few micro cracks propagated into very long longitudinal cracks. In biaxial tests, cracks tended to propagate into the gauge reducing the cross-section area. A strain-energy-based critical plane fatigue lifetime prediction model has been employed for life prediction of the material to account the effects of the additional hardening effect caused by the multiaxial load. The simulated evolution curves of the multiaxial damage and the predicted fatigue lives are in good agreement with the experimental results of CLAM steel.

Presenter: ZHAO, Yanyun (Institute of Nuclear Energy Safety Technology CAS)

Session Classification: P2