ME Seminar

Ultra Cryogenic High Cycle Fatigue Response and Microstructure Analysis of High Manganese Twinning Induced Plasticity Mechanisms of Fe-26Mn-0.4C Lightweight Steel

Sujith S V, Chungnam National University, South Korea

ABSTRACT

Dual-phase (DP) steels consisting of soft and hard phases can provide a combination of good strength, ductility and a high work-hardening rate, alleviating the strength-ductility trade-off. In DP steels, the high ductility originates from the better strain hardening behavior of the soft phase through the pronounced dislocation activities the formation of twinning and strain partitioning or strain-induced phase transformation. High manganese steel is cheaper, high strength and wear resistance as well as better performance at lower temperatures. High manganese steel is considered to be the promising alternative material that can replace the commonly used materials owing to its cost effectiveness. This has recently received attention as next generation materials for LNG fuel tanks. As compared to stainless steel this possess lower manufacturing costs. The materials have to keep excellent ductile characteristics under the cryogenic environment, down to 15 kelvin, in order to avoid the catastrophic sudden brittle fracture during the operation condition. In the present study, an intensive investigation of Fe-26Mn-0.4C has been performed under high cycle fatigue condition. A variety of factors affect the fatigue behavior of high manganese steels, which includes the metallurgical factors due to the presence of secondary precipitates and altering the slip plane characteristics which leads to the fatigue damage accumulation. The response of this steel at room temperature and ultra-low temperature (15K) has been analyzed and a clear identification of primary and secondary crack propagation in this steel under high cycle fatigue loading has been reported.

ABOUT THE SPEAKER

Dr. Sujith. S.V did UG from SCT Govt engineering college in 2010. He secured 99 percentile in GATE-2010, master's degree is from IIT Roorkee in 2012 from the MIED. Assistant professor in Pratap University Jaipur from 2012 to 2013. Freelancer as GATE mentor with GATE FORUM. Full time professor in LBS Govt: engineering college India. Received PhD degree in 2020 from the MIED IIT Roorkee. Research Professor in Materials science and engineering department Korea University-2021-2023, Prestigious Brain Korea 21 Fellowship. Awarded, prestigious national award, Binani Gold medal from Indian institute of metals and an add-on of 200 Euros from springer nature. From 2021-2023, part of collaborative research between POSCO/HYUNDAI steel and Korea University. Presently, Postdoctoral Fellow in CNU national university South Korea under BRL national fellowship. On April 1st-2024, starting his new position as Research scientist on behalf of an Italian grant: Politecnico di Torino, Italy in collaboration with General Motors.

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