Master thesis work

Low-cycle fatigue behaviour of high-entropy alloys

Motivation:

The demand for new alloys that offer high strength with excellent ductility has stimulated numerous research activities. During recent years a new class of alloys called high-entropy alloys (HEAs), consisting of at least five principal elements has been investigated extensively (George et al. Acta. Mater., 188, (2020) 435-474). This alloy design concept provides many options to vary alloy chemistry, and hence, offering promising structural and functional properties such as exceptional ductility and fracture toughness. With such superior properties, HEA could be considered as a potential candidate material for several structural applications. However, under certain applications, components undergo repeated reversible elastic-plastic loading, which demands sufficiently competent low-cycle fatigue (LCF) properties. However, LCF behaviour of HEAs has not been studied in depth so far; therefore, require thorough investigations.

Objectives and tasks:

The candidate is expected to perform uniaxial LCF tests and corresponding microstructural investigations, to achieve following objectives:

1. Characterize HEAs mechanical response to reveal phenomena such as cyclic hardening/softening and to determine effects of different testing parameters such as temperature, strain amplitude and strain rate on cyclic lifetime.
2. Analyse microstructural evolution by means of in-house electron microscopy facilities to understand deformation and damage mechanisms under cyclic loading.

Finally, the candidate is expected to document obtained results in the form of a master thesis.

Requirements:

This master thesis topic is aimed at mechanical or material science and engineering students with an interest in mechanical behaviour of materials and materials characterization. Prior knowledge in these fields would be an advantage.

For our similar recent published work, see: Lu et al. Mater. Sci. Eng. A, 791 (2020), 139781

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