Simulation and Fatigue in metal Additive Manufacturing

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Qualification of metal parts produced by additive manufacturing for critical load-bearing applications has to deal with many effects that potentially influence fatigue performance. The effects of surface quality, internal defects, local microstructure heterogeneity and anisotropy and residual stresses can be cited among others. The identification and mechanistic basis of the physical processes leading to crack nucleation and growth across the length scales (from micro to macro) are still major issues in many engineering fields and the establishment of quantitative prediction remains a key research challenge. While experiments provide irreplaceable insight into the link among AM process, material and performance, behavioral models and tools supporting AM part design in fatigue are expected from simulation and modeling activities. This session aims to bring together scientists and engineers addressing fatigue research utilizing experimental and modeling approaches (ideally integrated) including, but not restricted to :

- AM process - microstructure - fatigue interaction modeling
- Surface-related fatigue damage modeling
- Modeling of residual stress effects on fatigue damage and crack growth
- Multiaxial fatigue life prediction
- Fatigue crack growth under complex (including non-proportional) loadings
- Life prediction methodologies for metal AM parts
- Fatigue of meta-materials and lattice structures