



Contribution ID: 5

Type: **Oral presentation**

Microstructure Control in Additive Manufacturing Using Magnetic Fields and Strategic Scanning

Friday, 22 March 2024 12:00 (20 minutes)

The use of magnetic fields in laser additive manufacturing leads to thermoelectric magnetohydrodynamics (TEMHD). This phenomenon takes place in meltpools where the applied magnetic field interacts with the thermoelectric currents generated by large temperature gradients and induces flow. The melt flow governs the heat and mass transport and impacts the meltpool morphology. Scanning strategy can also modify the meltpool dynamics and solidification microstructure. To explore these phenomena a bespoke numerical code TESA (ThermoElectric Solidification Algorithm) has been employed. It is a parallel multiscale code that uses the Cellular Automata and Lattice Boltzmann methods. The results show that the numerical model can capture the competition between the TEMHD and Marangoni flow resulting in deep and narrow or shallow and wide meltpool shapes. Furthermore, time-dependent magnetic field and laser power scanning strategies lead to transient meltpool dynamics and they impact the final alloy microstructure.

Primary author: Dr KRASTINS, Ivars (University of Greenwich)

Co-authors: Prof. KAO, Andrew (University of Greenwich); Dr TONRY, Catherine (University of Greenwich); Prof. PERICLEOUS, Koulis (University of Greenwich); Prof. LEE, Peter (UCL); Dr SOAR, Peter (University of Greenwich); Dr FAN, Xiangqiang (UCL)

Presenter: Dr KRASTINS, Ivars (University of Greenwich)