

## MM 38: Invited talk Körner

Time: Wednesday 15:00–15:30

Location: BAR 205

**Invited Talk** MM 38.1 Wed 15:00 BAR 205  
**Single Crystals of Alloys by Additive Manufacturing** —  
•CAROLIN KÖRNER, MARKUS RAMSPERGER, JULIAN PISTOR, JOHANNES KÖPF, and MATTHIAS MARKL — Friedrich-Alexander Universität Erlangen-Nürnberg, Lehrstuhl WTM, Martensstr. 5, 91058 Erlangen

In materials science, single crystals are used for high strength materials with high creep resistance such as turbine blades from nickel-base superalloys. The fabrication techniques used to produce single crystals involve highly controlled and therefore relatively slow crystallization. For turbine blades, the Bridgman technique, i.e. investment casting

combined with direction solidification, is the standard. The single crystal either develops starting from a single crystalline seed or by a geometric grain selection process. Microstructure evolution is determined by the solidification conditions resulting in a dendrite arm spacing of several hundreds of microns. This contribution shows how single crystals from nickel-base superalloys develop without seed during layer by layer metal additive manufacturing in the powder bed. These AM single crystals develop under rapid and directional solidification conditions with solidification microstructures two orders of magnitude finer than in the conventional Bridgman process. The basis mechanisms leading to the single crystal and the implications on the resulting mechanical properties are discussed.