Control of the thermal field of the melt pool and its close environment during selective laser melting of powder bed for target metallurgy of a nickel-based superalloy

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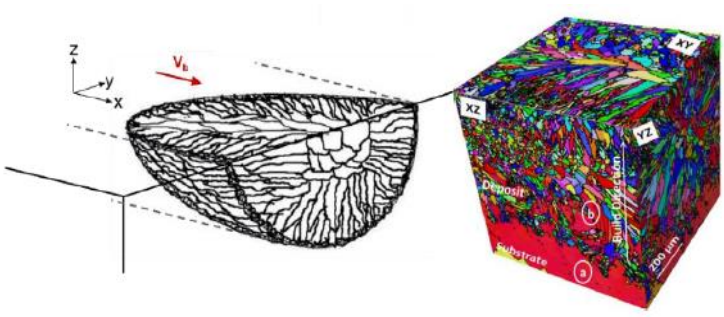

3D-schematic of fusion isotherm & columnar growth in a melt pool of IN718, with 3D replacement of EBSD mapping.

- Understanding of complex thermal history induced by selective laser melting process.
- Control of thermal field and gradient during fabrication.
- Post-treatment effects on microstructure.

Abstract:

Nowadays, industry continually needs to reduce the manufacturing steps of parts, costs and lead times as well as the ecological footprint of manufacturing lines. To meet these challenges, mechanical industry has placed great hopes in additive manufacturing in recent years.
However, some aspects are still poorly controlled and understood, such as the development of the microstructure under severe conditions of thermal gradients and solidification rates for the Selective Laser Melting (SLM) of powder bed.
Aim of the PhD is to understand and control microstructure induced by SLM process in order to obtain as-build parts with expected metallurgy.

Additive Factory Hub (AFH) was inaugurated on December 2017, and located in Digiteo-Saclay (CEA Paris-Saclay center). The AFH platform is in charge of structuring the industrial ecosystem in additive manufacturing around the research players of the Paris-Saclay and Île-de-France Campuses to meet the major industrial and economic challenges.
Additive Factory Hub's members and partners are: *AddUp, Air Liquide, AREVA NP, Arts et Métiers ParisTech, CEA, CETIM, CNRS, Dassault Systèmes, ENS Paris-Saclay, EDF, LNE, MINES ParisTech, Onera, Poly-Shape, Safran, SystemX, Paris-Saclay University, Paris-Sud University, Vallourec.*