

**Sabeur MSOLLI**

University of Technology of Belfort-MontBéliard

## **Numerical Analysis of Anisotropy and Crack Evolution in Cold-Sprayed Inconel 718 Coatings**

### **Abstract**

This study investigates the mechanical response of cold-sprayed (CS) Inconel 718 (IN718) coatings through numerical modelling, with particular emphasis on the influence of anisotropy and crack evolution. Finite Element Method (FEM) models were developed to analyze the tensile behavior of both as-sprayed and heat-treated coatings, incorporating crack widths and densities as governing parameters. The simulations demonstrate that cracks oriented perpendicular to the loading direction play a dominant role in reducing tensile strength, while crack density strongly affects anisotropic behavior. Model predictions show excellent agreement with experimental tensile data, accurately capturing both the magnitude of tensile strength and the distribution of crack widths in different orientations. Furthermore, the numerical results establish an empirical correlation between tensile strength and crack size, enabling predictive assessment of coating performance. By integrating these modelling outcomes, the study permits quantifying the effect of microstructural defects and anisotropy on the mechanical integrity of CS coatings, thus offering insights into the design, control and optimization of post-processing strategies.

### **Biography**

**Dr. Eng. Sabeur Msolli** holds a PhD in mechanics and materials from INPT (France, 2011). His research focuses on thermomechanical modeling of materials and manufacturing processes. He has worked at leading institutions in France (National Polytechnical Institute of Toulouse, University of Technology of Troyes , University of Lorraine - LEM3, ENSAM ParisTech (FRANCE)), South Korea (Dongguk University), and Singapore (IHPC/A\*STAR), specializing in plasticity, damage modeling, and surface enhancement techniques (laser shock peening, cold spray, additive manufacturing). Since 2021, he has been an Associate Professor at UTBM (France), affiliated with ICB-PMMDM-LERMPS. With **40+ journal papers** and **30+ conference participations**, his work advances material characterization and process simulation.