# MATERIALS SCIENCE AND TECHNOLOGY

## Ammin - Development and characterization of copper and copper alloys for additive manufacturing in the aerospace sector

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| **Funded By** | Politecnico di TORINO [P.iva/CF:00518460019] |
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| **Context of the research activity** | The research is aimed at the development, optimization, and characterization of copper and copper alloys for aerospace applications. The activity will focus on the study of processability (e.g., LPBF, EBPBF), the process–microstructure–property relationships, and the thermo-mechanical performance as well as the electrical and thermal conductivity of components produced by additive manufacturing technologies. |
| **Objectives** | The research project focuses on the development and optimization of copper and copper alloys for aerospace applications through additive manufacturing technologies. The activity will investigate the processability of innovative copper alloys, specifically developed, using advanced powder bed fusion techniques (e.g., LPBF and EBPBF), with particular attention to the influence of process parameters on melt pool stability, defect formation (porosity, cracking), and dimensional accuracy.<br>A central aspect of the research will be the analysis of process–microstructure–property relationships, including microstructural evolution, phase stability, and texture development. The resulting mechanical behavior (strength, ductility, fatigue resistance) and functional properties (thermal and electrical conductivity) will be systematically characterized.<br>The project will also investigate post-processing heat treatments aimed at tailoring microstructure and enhancing mechanical and functional properties. The study will evaluate the effect of different heat treatment cycles on phase stability, residual stress relief, and microstructural homogeneity, with the objective of defining optimized processing and post-processing routes for high-conductivity copper-based components manufactured via additive technologies. |
| | Master's degree in Materials Science and Engineering, Metallurgical Engineering, Mechanical Engineering, or a related field.<br>Solid background in physical metallurgy and structure–property relationships of metallic materials.<br>Knowledge of additive manufacturing technologies, particularly powder bed |

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| **Skills and competencies for the development of the activity** | fusion processes (e.g., LPBF, EBPBF).<br>Experience in microstructural characterization techniques (e.g., optical microscopy, SEM, EBSD, XRD).<br>Familiarity with mechanical testing and thermal/electrical property evaluation.<br>Basic understanding of heat treatment processes and phase transformations in metallic alloys.<br>Ability to analyze experimental data and interpret process–microstructure–property correlations.<br>Good proficiency in English (written and spoken).<br>Strong analytical skills, problem-solving attitude, and ability to work both independently and within a research team. |