

PhD Position – Joint Doctoral Programme (KU Leuven – University of Lille)

Thesis title: Near-Net Shape Manufacturing of Innovative Multi-Materials

Many engineering applications require a combination of material properties that cannot be accommodated by a monolithic material, often referred to as the *Multiple Functionality Challenge*. Incorporating multiple materials within a single component is challenging given the processing constrictions imposed by the materials that will be combined. When combining metallic alloys, one often has to compromise between strength and ductility as most strengthening mechanisms hamper dislocation movement and plastic shaping capabilities. Powder metallurgical (PM) processing routes provide the potential to create multi-materials and functionally graded materials (FGMs) as a local compositional and concomitant property gradient can be created. Compared to conventional casting and additive manufacturing (AM), however, PM processing routes often suffer from limited near-net shaping capabilities, often requiring extensive and costly post machining. The latter, hereafter, will be referred to as the *Near-net Shaping Challenge*. The objective of the joint PhD programme is to develop and demonstrate the capabilities of novel PM processing routes, combining the layer-by-layer feature of AM and pulsed electric current sintering, allowing to fabricate near-net shape components that incorporate multiple materials, addressing the near-net shaping and multiple functionality challenge.

This joint PhD project is co-funded by KU Leuven (Leuven, Belgium) and the University of Lille (ULille, Lille, France). The doctoral research will focus on single and multi-powder selection (Ni-based, Al-based alloys, etc.), PM processing and PM process simulation using finite elements (KU Leuven), advanced microstructural characterization using state-of-the-art transmission electron microscopy (ULille) and mechanical characterisation combining laboratory-scale mechanical testing (KU Leuven) and (*in-situ*) synchrotron experiments at DESY (Hamburg, Germany).

The host institutions are the Department of Materials Engineering at KU Leuven (<https://www.mtm.kuleuven.be/english-pages#>) and Unité Matériaux et Transformations (UMET, CNRS UMR8207) laboratory at ULille (<https://umet.univ-lille.fr/>).

The preferred starting date is October or November 2026. The PhD duration is 4 years.

We are seeking a highly motivated candidate holding a Master's degree (or equivalent) in Materials Science and Engineering or Mechanical Engineering to join our international research teams. Experience in powder metallurgy processing and/or electron microscopy would be considered a strong asset. Good communication skills in English are required. A general interest in combining numerical simulations with experimental processing and characterisation is required.

Interested candidates are invited to send their CV and a motivation letter directly to prof. Kim Vanmeensel (kim.vanmeensel@kuleuven.be) and dr. Gang Ji (gang.ji@univ-lille.fr).