

## PhD position at Plansee Tungsten Alloys / UCBL – LMI

Plansee Tungsten Alloys (PTA) is a world leading manufacturer in the design, development and production of finished and semi-finished products made from tungsten heavy alloys (WHA). Those alloys are produced by powder metallurgy. Based on local development from new process and products to meet the ever increasing demand from customers, WHA are designed to satisfy the most demanding applications in extreme conditions. Notably in the defence business, the improvement on material for kinetic energy penetrators is one of the main tasks of PTA's R&D division.

WHA are mainly composite materials of nodular tungsten phase surrounded by a binder Ni based phase containing several elements on solid solution containing alloying elements like Fe, Co, Cu amongst others. As such, several studies were carried out on the past in order to enhance the mechanical properties of tungsten heavy alloys in order to improve the penetration performance of those kinetic energy penetrators. Also, the current environmental concern had pushed the research further on Co free kinetic energy penetrators, currently produced by PTA as well.

In order to better improve current alloys from an industrial perspective, joining altogether with the industrial needs, deeper research on some domains are required concerning W-Ni-Fe-Co systems:

1. Kinetic aspects on microstructure evolution on industrial post-sintering treatment
2. A better thermodynamic description of those systems in order to identify domains where treatment could represent an issue.

Those two objectives are essential in order to acquire the understanding necessary to industrially improve those alloys. The first objective will require several tests with slight variations on the chemical composition, identifying the possible risk zones where brittle phases might appear during industrial treatment. Also, those results can lead to industrial process optimization.

The efforts from the first objective can be further analyzed by the extensive know how from the University of Lyon on the thermodynamic domain, which is the basis of the second objective. Presently, there is no dedicated thermodynamic simulation database for WHAs. Using the available data can lead to incongruences on the equilibrium phase diagrams. We suggest that the Calphad approach should be used to improve the results obtained from previous studies from the PTA and University partnership.

### **Candidates:**

Alumni from Master level, specialized in "Materials Science", "Materials Chemistry", "Physics of Materials". Candidate will have to be fully engaged in the experimental study and have interest and affinity for numerical simulations.

### **Conditions:**

- Localisation: Both at LMI laboratory on the LyonTech La Doua campus nearby Lyon and at the Plansee Tungsten Alloys production site in St Pierre en Faucigny (Savoie suburb of Geneva).
- Salary: 3 years – about. 23 K€/an.

### **Contacts:**

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