



Master's internship proposal

Tribology of amorphous metallic alloys: design of a tribometer and experimental tests

Working environment

The trainee will work at the Department of Applied Mechanics of the Femto-ST Institute in Besançon (France), and more particularly within the "Tribology, Functionalization and Characterization of Surfaces" group (TFCS). This research group is composed of researchers, engineers and PhD students who are specialists in tribology (study of friction, lubrication, and wear). The TFCS group has extensive expertise in the study of the tribological behaviour of all types of materials related to a wide range of industrial applications. Our team has numerous surface characterization tools, and about ten home-made experimental devices dedicated to the study of friction and wear (tribometers).

Background

Amorphous metallic alloys (AMAs) are new materials obtained by an innovative manufacturing process that allows a mixture of metal powders initially heated to above its melting temperature to be cooled at very high speed. The result is a non-crystalline metallic alloy with exceptional mechanical properties compared to conventional crystalline alloys: extremely high yield strength, high hardness, high deformation capacity, high fatigue strength... As a result, AMAs are very promising materials for a wide range of high-tech applications. Nevertheless, the use of these materials is still limited on an industrial scale because their friction behaviour remains poorly known and unreliable. The TFCS group has been studying the tribological performance of AMAs for several months through experimental tests in close collaboration with Vulkam, the unique European company producing AMAs of various compositions in series. The trainee will reinforce the project team associated with this study.

Goals and tasks

The trainee will carry out two closely related activities focused on the tribology of AMA:

- Design of an instrumented tribometer: CAD, integration of sensors (forces and displacement) and of an actuator, digital acquisition of physical data, development of the device.
- Conduct friction tests on AMAs using a working tribometer and well established test procedures, and then analyze the friction tracks with a 3D optical roughness analyzer.

This dual mission will allow the trainee to acquire skills in design and dimensioning, instrumentation and sensors, data acquisition, and experimental testing. These are highly valued R&D skills.

Skills

Design and CAD - Ability to work in a team in project mode - Precision and accuracy - Taste for experimentation
Ability to report on the work done - Autonomy and initiative - Motivation and enthusiasm

Further information

- Applications (CV and cover letter in pdf format) should be sent as soon as possible by e-mail to the internship supervisors: P-H. Cornuault (pierre-henri.cornuault@ens2m.fr) and G. Colas (guillaume.colas@femto-st.fr).
- Duration: 5 to 7 months. The starting date (~ beginning of February 2019) will be defined with the trainee.
- Salary: about 570 € / month.