

Post-doctoral employment description:

Position Sensitive Detector for the development of Atom Probe Tomography

Supervisor: François Vurpillot (Pr) / Gerald Da Costa (IR CNRS)

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Laboratory: GPM / UMR CNRS 6634

Location: Instrumentation Dep. UMR CNRS 6634 Technopole du Madrillet, Institut des materials, 76800 Saint Etienne du Rouvray

Industrial partner: CAMECA (Genevilliers / France and Madison / USA)

Employer Institution: University of Rouen (Salary dependant of the applicant experience)

Duration : 2 years. (from October 2021 to September 2023)

Candidate profile:

The candidate (man or woman) must have a Phd in physics, electronics, instrumentation or related disciplines and a keen interest in academic research in an industrial development environment. A possible experience (projects, internships, etc ...) in the field of electronic design, and scientific instrumentation would be appreciated. The candidate will be supervised by specialists in scientific instrumentation, physics, and materials science. The candidate must have an excellent level in English (frequent meetings with our industrial partner)

Subject of the postdoc :

The tomographic atom probe is a quantitative nano-analysis tool that allows us to image in three dimensions a small volume of a metal sample at the atomic scale. This instrument was developed in the lab 30 years ago. It is now an indispensable tool in materials science whether in the fields of micro-electronics (development of integrated system, physical cause analysis of their failures...), energy and metal materials industrial purposes (automotive, aeronautics, nuclear industry ...). This instrument is commercialized by CAMECA (about 100 machines installed worldwide in universities or private research centers).

The basic principle of this technique is the field evaporation of atoms of a sample, and detection of these emitted particles in the form of ions by a high-performance detector. The detector converts the impact of an ion (a few keV kinetic energy) into a coordinate (X, Y) and flight time. Since 1993, several generations of detector for atom probe has been developed by the instrumentation team, with each generation a technological leap that allowed improving significantly the performances of the instrument.

This post-doctoral research project (collaboration with CAMECA) proposes

1/ Development of new Tomographic Atom Probe position sensitive detectors (PSD), with the integration of a fast and efficient digitalization of signals and related signal deconvolution and timing combination algorithms. The limitations in term of multihits / data throughput / data quality will be first evaluated on test PSDs. From these results, a setup will be developed in close collaboration with CAMECA and GPM teams, to integrate the best system to a commercial AP.

2/ Development of Carbon Foil enhanced position sensitive detectors (CFE-PSD). Optimization of the system to enable an increase in detection efficiency and to improve the will be done. The design of the CFE-PSD will be adapted to increase the efficiency of collection and multihit capabilities. Hit finding and association algorithm will be improved.