

Research Topic for the Arts et Métiers ParisTech - CSC PhD Program

Subfield: Applied Physics, Fluid Mechanics

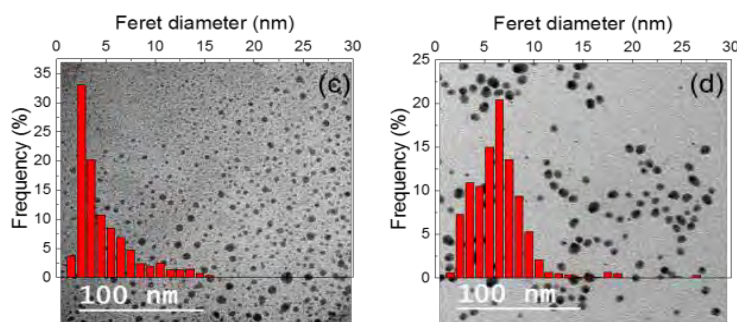
ParisTech School: Angers

Title: Numerical study of the coupling between hydrodynamics and nanoparticle generation

Advisor(s): A. Ambari, S. Champmartin, N. Chaoui
Stephane.Champmartin@ensam.eu

Short description of possible research topics for a PhD

Pulsed-Laser Ablation of a solid target in a Liquid medium (PLAL) is a green and versatile technique for the production of nanoparticles (NPs) suitable for catalysis, bio-sensing and other applications. Nevertheless, this method suffers from its low productivity, reproducibility and particles size control. We want to elucidate the role of fluid dynamics on NPs transport to address these issues. The instabilities in the flow around a rotating target will be investigated numerically and new designs will be proposed to limit their impact on the NPs generation. The role of the bubble formation could possibly be addressed. The numerical results will be compared to experimental data from a novel PLAL design based on the irradiation of a cylindrical target rotated at high-speed.



TEM micrograph of the particles generated and the particles size distribution

Required background of the student: the applying student must have a good background in Fluid Mechanics, CFD (Fluent/COMSOL), Physical Chemistry

2-3 representative publications of the group:

G.C. Messina *et al.*, *Phys. Chem. Chem. Phys.* 2013, **15**, 3093; S. Scaramuzza *et al.*, *J. Phys. Chem. C*, 2016, **120**, 9453

A. Resano-Garcia, S. Champmartin, Y. Battie, A. Koch, A. En Naciri, A. Ambari and N. Chaoui, *Highly-repeatable generation of very small nanoparticles by Pulsed-Laser Ablation in Liquids of a high-speed rotating target*» accepted for publication in *Physical Chemistry Chemical Physics* 2016

FOR APPLICATION, PLEASE CONTACT ADVISOR(S) BY EMAIL WITH COPY TO:
ali.siadat@ensam.eu AND yvon.velot@ensam.eu