

## Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website [www-csc.utt.fr](http://www-csc.utt.fr))

Supervisor's name : Feuillard

Given names : Guy

Status (prof., assistant prof., ...) : full professor

Laboratory : GREMAN

Website address :

[www.greman.univ-tours.fr](http://www.greman.univ-tours.fr)

Institution : INSA Centre Val de Loire

Website address :

[www.insa-centrevaldeloire.fr](http://www.insa-centrevaldeloire.fr)

Scientific competence :

Ultrasonic wave propagation and modeling, ultrasonic instrumentation, ultrasonic characterization, poroelasticity, SAW sensors, Photocatalytic degradation monitoring.

Two major publications in the field proposed for the PhD :

Fortineau, J. P., Meulen, F. Vander, Fortineau, J. & Feuillard, G. Efficient algorithm for discrimination of overlapping ultrasonic echoes. *Ultrasonics* 73, 253–261 (2017).

F. Dubosc, L. Blanc, J. Fortineau, and M. Lethiecq A Novel Design of Surface Acoustic Wave Device: Towards Sensor Sensitivity Enhancement *Sensor Letters*, Volume 15, Number 12, December 2017, pp. 970-976(7)

Website address of the personal page :

Supervisor's email : [guy.feillard@insa-cvl.fr](mailto:guy.feillard@insa-cvl.fr)

**Description of the research work proposed for a PhD**

**Topic # (see list) :** VI-6, IV-11

Title : In situ ultrasonic characterization of photocatalytic thin films

Subject :

Sensors are now widely used for chemical species detection or environmental measurements. Among the different types of sensors, surface acoustic wave (SAW) devices constitute a class of sensors widely studied. In these sensors, a highly sensitive thin film causes a variation of the acoustic properties of the wave, according to its environment. So, the detection of these variations allows environment changes to be detected. Previous studies have been conducted by L. Blanc et al. to monitor the photocatalytic degradation of pollutants using thin porous TiO<sub>2</sub> films. In order to better understand the acoustic variation and link them to the reaction kinetics, a study of the wave propagation through the propagation path is needed. In a first phase, an analytical model of the wave propagation will be implemented in order to estimate the influence of several parameters, such as sorption or mass loading. This model will be experimentally tested on SAW devices designed and manufactured in the laboratory. Finally these results will be used to optimize the thin film, such as porosity, thickness and formulation, in order to enhance the SAW sensor sensitivity for photocatalysis monitoring. Research will be conducted in the GREMAN laboratory. This topic is a joint research topic between the acoustic and microsystem team, allowing to work simultaneously on propagation modeling and on microelectronic systems.

Keywords :

SAW sensors, photocatalytic degradation monitoring, ultrasonic spectroscopy.

Expected collaborations :

C. Boissière, UMPC; C.Dejous, IMS

Background required from the applicant :

Candidates should have a Master's degree in Acoustics or Physics. Candidates must have good skills in modeling and numerical simulation, as well as a strong taste for experiment.

Existence of a PDF file detailing the proposal ("yes" or "no") : "yes"

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