ParisTech ESPCI PARIS PSL

RESEARCH TOPIC FOR THE PARISTECH/CSC PHD PROGRAM

Field: Materials Science, Mechanics, Fluids

Subfield: (Applied Physics and electrical engineering)

Title: Contact effects at metal/insulator interfaces

ParisTech School: ESPCI Paris | PSL

Advisor(s) Name: Stéphane Holé
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Research group/Lab: Physics and Material Study (LPEM)
Lab location: ESPCI – 10, rue Vauquelin – 75005 Paris – France
(Lab/Advisor website):

Short description of possible research topics for a PhD:
When two materials are brought into contact, electric charge transfer from one material to another occurs at the interface. This gives rise to a contact potential. Though it is well described when metals and semiconductors are concerned, this is still not well established when an insulator is concerned, because no measurement can be carried out.
We have proposed a new measurement method for directly accessing the contact voltage in the case of metal/insulator contacts based on an electro-elastic coupling. The advantage of the method is that no material model is required to obtain the information.
The aim of the PhD is to improve the calibration procedure, test various metal/insulator interfaces and propose an interface model from the observed results.

Required background of the student: (What should be the main field of study of the applicant before applying?)
The applicant should have skills in solid state physics, instrumentation (in electronics bases at least) and matlab or python language.

A list of 5 (max.) representative publications of the group:

1. Holé S., *Contact potential measurement at metal/insulator interface*, ISE, p. 51, 2019. available at https://ise2019.mosaicteam.eu/wp-content/uploads/2019/09/ISE17_2019_AbstractBook.pdf.
2. Salamé B. and Holé S., *Elasto-electric coupling for direct electric field distribution measurement in semiconductor structures*, J. Appl. Phys., vol. 120, p. 175702 (2016)
3. Salamé B.and Holé, S, *The pressure wave propagation method for the study of interface electric field*, EIC, pp. 53-56 (2015)
4. Salamé B. and Holé, S., *Electrode induced signal with Pressure-Wave-Propagation Method*, ISE, p. IX.7 (2014)
5. Ravat C., Absil, É., Holé, S. and Lewiner, J., *Acoustoelectric coupling for direct electrical characterization of semiconductor devices*, J. Appl. Phys., vol. 99, pp. 063712-1-5 (2006)