

## Master and Engineer Internship: 2019-2020

Proposed by : Djamila Hourlier / Stéphane Lenfant

Phone number : 03 20 19 78 36/79 07

E-mail : [djamila.hourlier@univ-lille.fr](mailto:djamila.hourlier@univ-lille.fr) / [stephane.lenfant@univ-lille.fr](mailto:stephane.lenfant@univ-lille.fr)

Research group : EIPHY / NCM

**Title:** Electrical characterization of silicon carbide semiconductors derived from agro-wastes

**Abstract:** Silicon carbide (SiC) exhibits exceptional properties, among others, corrosion resistance at high temperatures, low thermal expansion, and high thermal and electrical conductivity. All these properties make this material as a promising candidate for electronic applications operating at high temperatures and harsh atmosphere.

In general, almost all commercially available silicon carbide is essentially a synthetic material because it is extremely rare in nature. SiC can be produced in many different forms (fibers, powder, sintered monolithic bulk, and coating) through various chemical processes (chemical vapour deposited or the carbothermal reduction of silica).

The aim of this study is twofold. First, fabricate SiC-based nanocomposite materials using an alternative eco-friendly synthesis method from cheap and abundantly available agricultural wastes. The second contribution is to characterize electrically the resulting silicon carbide-based materials.

Electrical properties of materials depend on several parameters including their composition, processing conditions, their structure, and their porosity.

The work will comprise both methodological developments and applications to allow for accurate assessment of electrical properties:

- (i) the electrical conductivity AC and DC (from 20 Hz to 1 MHz) in function of the temperature
- (ii) and also the capacitance in order to extract the permittivity in function of the frequency.

The offer is quite open in terms of education. However, a basic knowledge in Physics and processing materials is highly appreciated though the later will likely be learned largely from the host team.