INTERNSHIP OFFER

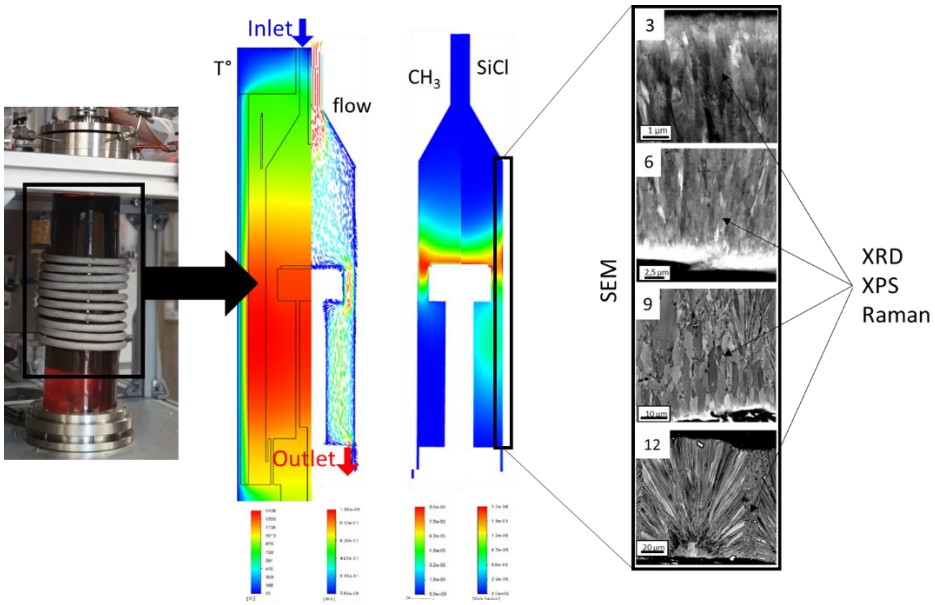
Master 2 or 3rd year of engineering school

Microstructure of polycrystalline SiC deposited by CVD: establishing a relationship with local growth conditions

Duration	6 months, starting from february/march 2025
Location	Laboratoire SIMaP, 1130 Rue de la Piscine - BP 75 – 38402 Saint Martin d'Hères – France
Contact	Yann GALLOU – Research Engineer at Mersen, detached at SIMaP yann.gallou@grenoble-inp.fr/yann.gallou@mersen.com

Context & objectives

Today, for ecological and geopolitical considerations, we need to reduce our dependence on fossil fuels. To achieve this, a massive electrification of society is envisaged in which power electronics components will play a key role. **Silicon carbide**'s exceptional physical properties make it an ideal material for the manufacture of these components, which however depend on the availability of large single-crystal substrates of excellent crystalline quality, still considered too costly. A high-potential alternative to conventional substrates consists in transferring a thin film of monocrystalline SiC onto a **polycrystalline SiC (poly-SiC) substrate** which must be thick, highly conductive (thermal and electrical) and flat. **Mersen company** produces such poly-SiC substrates by **Chemical Vapor Deposition** (**CVD**). The microstructure of the poly-SiC (grain size, crystalline quality, preferential orientation…) is key since it dictates the properties of interest and also its ability to be post-processed. During chemical vapor deposition, **the microstructure of the deposit is closely related to the local growth conditions** (temperature, concentration of reactive species…). While it's not possible to directly measure these growth conditions, **simulation tool can be used to evaluate them**. In a previous PhD project, a full modelling of a lab-scale reactor was realized and first trends were established regarding the links between microstructure and local growth conditions. The idea of the present internship is to characterize more extensively this relationship by **extending the range of process conditions** (pressure, temperature, mass flow rates…). This will involve the use of different characterization tools, among which X-ray diffraction and electron microscopy will be essential. In addition, other tools such as Raman and X-ray photoelectron spectroscopy will be used. The microstructural features will be linked to the local growth conditions obtained from simulation (simulations not realized by the intern).



In practice the intern will be in charge of:

- Reviewing the literature on the relationship between growth conditions and microstructure
- Using a lab-scale chemical vapor deposition reactor from in autonomy
- Preparing the samples for characterization: cutting, polishing…
- Characterizing the samples and analyzing the data (optical microscope, SEM, XRD…)
- Reporting her/his results periodically

The internship will take place in the framework of a very dynamic and long-term collaboration between MERSEN company (https://www.mersen.com/fr) and SIMaP (https://simap.grenoble-inp.fr/), a research lab specialized in materials sciences and associated processes. Therefore, you'll have one foot in acadamia and the other one in industry, allowing you to see how these two can collaborate for tomorrow's discoveries and developments.

Profile & requested skills

We are looking for a highly motivated student (M2 or 3rd year of engineering school) with a background in material science and who shows interest in research and experimental work. The student must be dynamic, curious and autonomous. The student must speak French and/or English.