INTERNSHIP OFFER

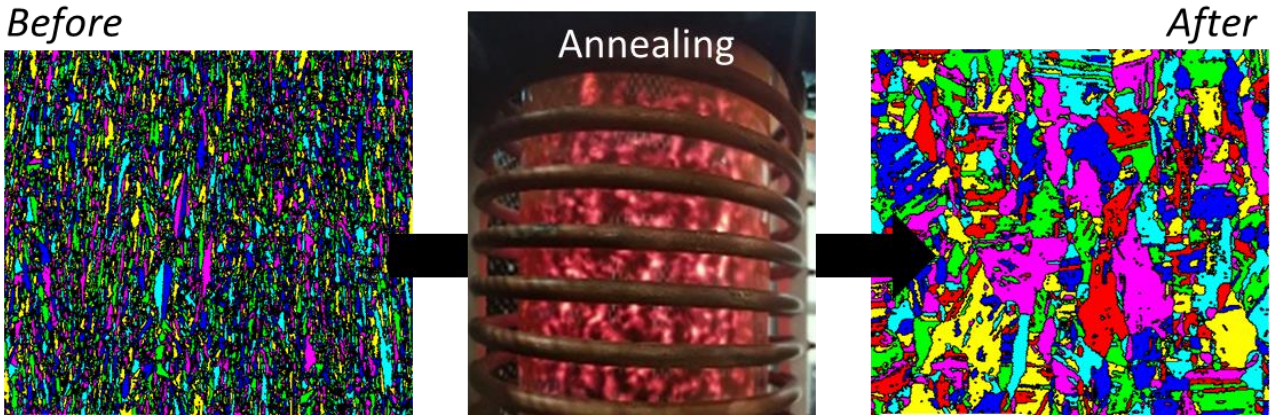
Master 2 or 3rd year of engineering school

Annealing of polycrystalline SiC deposited by CVD: understanding the recrystallization mechanisms

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 substrate** which must be thick, highly conductive (thermal and electrical) and flat. **Mersen company** produces such poly-SiC substrates by **Chemical Vapor Deposition** (**CVD**). To enhance the properties (electrical/thermal conductivity) of these substrates and relieve residual stresses, **thermal treatments (annealing) are conducted**. During annealing, **recrystallization appears to be an essential step**. Recrystallization occurs with different kinetics, depending on the initial state (microstructure/composition) of the poly-SiC substrates. A **better understanding of the underlying mechanisms** is then sought for. This will require a wide range of microstructural characterizations among which electron microscopy (**SEM, EBSD**) will be essential for recrystallization kinetics monitoring and investigation of the underlying mechanisms: recrystallized fraction, grain size, orientation, nature and density of GB… In a second part, the effect of recrystallization on the electrical conductivity (4-probes method) and eventually thermal conductivity (partnership to be envisioned) will be studied.



In practice the intern will be in charge of:

- Reviewing the literature on recrystallization of polycrystals
- Carrying out annealing of poly-SiC samples in a high temperature inductive furnace
- Preparing the samples for characterization: cutting, polishing…
- Characterizing the samples and analyzing the data (optical microscope, SEM, EBSD, XRD, 4-probes…)
- 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.