INTERNSHIP OFFER

Master 2 or 3rd year of engineering school

Evaluation of graphite corrosion by SiC vapors during the PVT process

Duration	6 months, started from february/march 2026
Location	Laboratoire SIMaP, 1340 Rue de la Piscine - BP 75 – 38402 Saint Martin d'Hères – France
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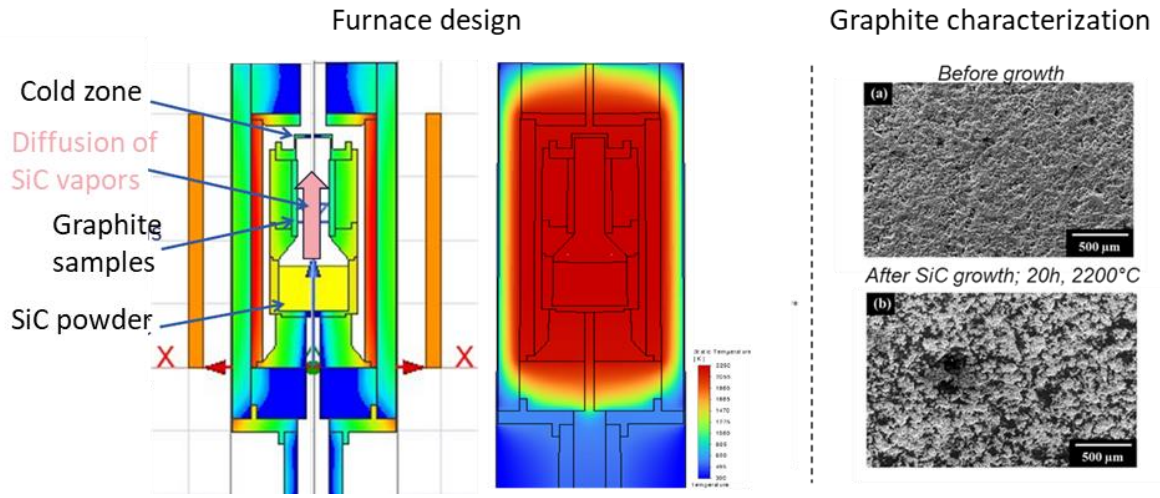
Context & objectives

Today, for ecological and geopolitical considerations, we need to reduce our dependence on fossil fuels. To achieve this, a massive electrification of society is envisioned in which power electronics components will play a key role. **Silicon carbide**'s exceptional properties make it an ideal material for the manufacture of these components. Today, the SiC industry is booming and demand for high-quality SiC single-crystal substrates used in the manufacture of these components is growing rapidly. These substrates are fabricated from SiC boules grown by a **very high temperature (~2500°C)** process **named the PVT process,** for physical vapor transport process. This process involves the sublimation of a SiC powder in a closed **graphite crucible** and the recondensation on a seed, maintained at lower temperature. During their transport, SiC vapors interact with the graphite crucible, **causing its degradation (corrosion).** The corrosion rate is of paramount importance since it will influence the SiC growth process and the lifetime of the crucible. The nature of the graphite crucible (porosity, graphitization degree…) is known to influence the way it reacts with the SiC vapors. However, very limited data (kinetics, mechanisms…) and knowledge exists in the literature. To overcome that, an original furnace has been designed numerically to monitor the corrosion of different graphite grades with varying local conditions (temperature and vapor supersaturation). A typical design is shown below, it consists of a chimney PVT-like reactor, the chimney being constituted by the studied materials. The proposed internship aims at **conducting the first experiments on this furnace, and establishing the methodologies used for the monitoring of graphite corrosion**. Then, a more systematic study will be conducted to assess **links between graphite microstructure/composition and corrosion.** The experimental results will also be used to develop an accurate simulation model (Finite Element) of the process, with the ultimate goal of recovering the reaction kinetic rates via inverse methods. This modeling part will be realized aside of this internship.



In practice the intern will be in charge of:

- Reviewing the literature on the corrosion of graphite by SiC vapors
- Running experiments in a high temperature inductive furnace
- Preparing the samples for characterization: cutting, polishing…
- Characterizing the samples with various methods: optical microscope, optical profilometry, SEM, EDS, XRD, Raman, XPS…
- Analyzing the data and reporting the 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.

Profile & requested skills

We are looking for a highly motivated student (M2 or 3rd year of engineering school) with a background in materials sciences 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.