Porous silicon particle functionalization

Supervisor: Dr. Thomas DEFFORGE – GREMAN lab.

Background and objectives of the study: At the GREMAN laboratory, a team is working on the synthesis and characterization of porous silicon. This material is made up of nano-sized pores and can be synthesized by electrochemical etching of single-crystal silicon. It can be used in a wide range of applications including microelectronics, energy storage and biomedical applications. GREMAN has been focusing on biomedical applications for the past 5 years. The porous nature of these particles enables them to be loaded drugs, which are then released *in vivo*. Controlling the surface chemistry of particles is an important parameter in several respects such as particle biocompatibility and *in vivo* silicon degradability kinetics [1].

The aim of the internship will be to optimize particle functionalization and carry out physico-chemical characterization. Particle functionalization will involve grafting molecules onto the particle surface [2] and/or depositing a protective shell of metal organic framework (MOF) [3] around the particles. To characterize the synthesized objects, students will have access to a range of equipment (scanning electron microscope, FT-IR, granulometry and zeta potential measurement in particular).

Bibliography:

[1] Chaix, A., Griveau, A., Defforge, T., Grimal, V., Le Borgne, B., Gautier, G., & Eyer, J. (2022). Cell penetrating peptide decorated magnetic porous silicon nanorods for glioblastoma therapy and imaging. *RSC advances*, *12*(19), 11708-11714.
[2] Jung, Y., Huh, Y., & Kim, D. (2021). Recent advances in surface engineering of porous silicon nanomaterials for biomedical applications. *Microporous and Mesoporous Materials*, *310*, 110673.
[3] Ahmadi, M., Ayyoubzadeh, S. M., Ghorbani-Bidkorbeh, F., Shahhosseini, S., Dadashzadeh, S., Asadian, E., ... & Siavashy, S. (2021). An investigation of affecting factors on MOF characteristics for biomedical applications: A systematic review. *Heliyon*, *7*(4).

Laboratoire GREMAN : https://greman.univ-tours.fr

Candidate profile: The candidate, from a university or engineering school (4th or 5th year internship), should have a good knowledge of materials chemistry.

Application: email a detailed CV and cover letter.

Contact:

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