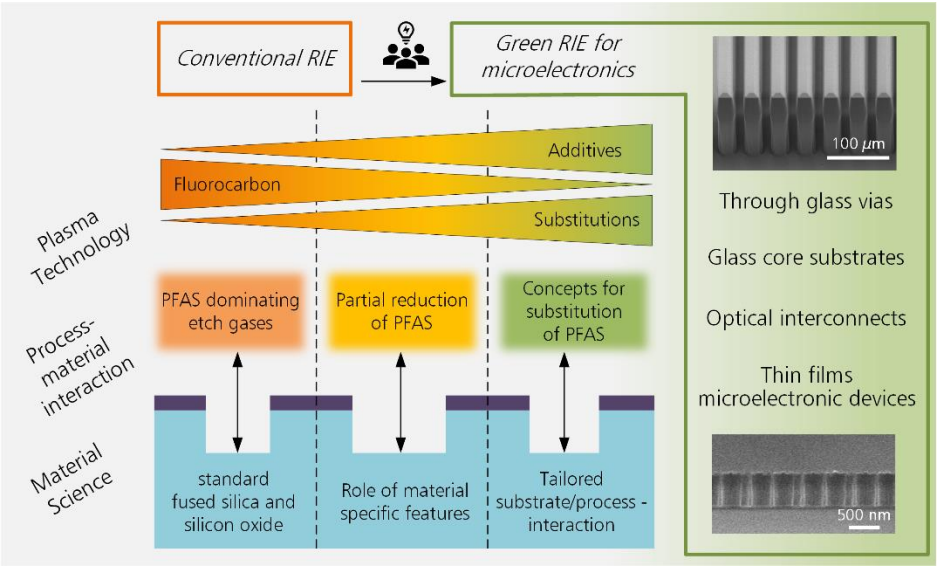
Project 2: Green Reactive Ion Etching of silicon oxides for microelectronic application (Go gRIEn)

Glasses represent high-tech materials that are of great current and future importance for microelectronics and innovative computer architectures. One of the leading semiconductor manufacturer is working on the next generation of optical interconnects using glass core substrates and co-packaged optics.[1] Silicon dioxide thin films are insulating with high resistance and mainly used for core microelectronic functionalities such as gate oxides.[2] Glass-based materials are also considered attractive options in the field of 5G and upcoming 6G micro-electronics.[3]
However, the required microstructuring of glass by dry etching is a relatively time and energy-demanding process that involves aggressive chemicals. This project focusses therefore on efficient reactive ion etching (RIE) processes with nanometer-range precision that offer an improved environmental compatibility, which is a key demand for future microelectronic fabrication in diverse fields. It is a project goal to contribute to the gradual substitution of perfluorinated and polyfluorinated alkyl compounds (PFAS)-containing gases (CF_4, C_4F_8, CHF_3 etc.) hand in hand with the reduction of global warming potential (GWP) for plasma structuring of fused silica bulk materials as well as SiO_2 thin films by combined alternative chemical and physical attack.
The project is directly related to other "green electronics" projects that are concerned with the microfabrication of electrical devices and functional structures, which enables a lively interdisciplinary exchange. The project itself covers scientific aspects of materials sciences, glass chemistry, plasma etching, and microtechnology.



[1] A. Schilling, *Multi-Chip-Packages: Intel über Glassubstrate, Die-Testing und Package-Fertigung - Hardwareluxx* **2023**.
[2] J. X. J. Zhang, K. Hoshino (Eds.), *Molecular Sensors and Nanodevices 2e: Principles, Designs and Applications in Biomedical Engineering*, Elsevier Science & Technology, San Diego **2018**.
[3] M. Zhai, P. Bhaskar, H. Shi, M. Swaminathan, A. Locquet, D. S. Citrin, *J Infrared Milli Terahz Waves* **2023**, *44*, 841.