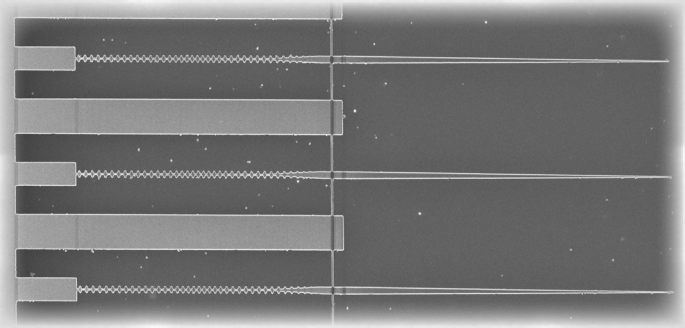
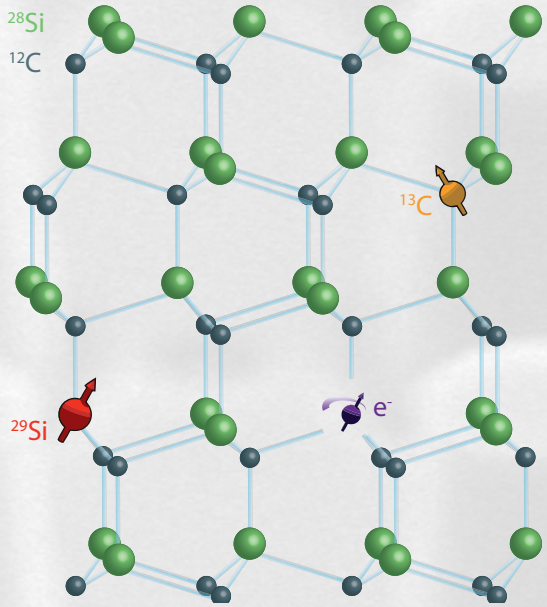
Open positions for master thesis project:
Integration, creation and control of colour centres in nanophotonic devices for scalable quantum networks

Taminiau Lab, QuTech

Using **colour centres** in solid state materials, like diamond and Silicon Carbide, allow you to **entangle quantum processors** using **photonic links** on chip and off chip [1]. This paves the way for distributed quantum computing and the foundation of a quantum network. By integrating these colour centres in **nanophotonic devices** you can improve the optical properties of the qubits. This improves the entanglement rate and works towards a **scalable platform** for quantum networks. **Silicon Carbide** is one of the solid state platforms which allows for colour centre integration in nanophotonic structures.





Colour centres in 4H-Silicon Carbide have shown themselves to be an interesting candidate for scalable quantum applications. Especially due to their **outstanding spin-optical** properties [2,3] and the successful integration of defects in nanophotonic structures [4,5]

Project Directions

In the SiC team of the Taminiau lab, there are three possible routes to explore. All these topics offer you the flexibility and freedom to design your own project, aligning it with your interests and passions.

1. Building an optical setup capable of deterministically **creating localised defects** in 4H-SiC with a Pulsed UV laser
2. Establishing **spin control** in nanophotonic devices using microwave pulses
3. **Fabricate** and optimize **Photonic Crystal Cavities** in 4H-SiC in a state-of-the-art clean-room, together with characterisation in an optical lab

Interested?

Contact: Laurens Feije
or Gerben Timmer

[1] M. Pompili, et. al., Science 372, 259–264 (2021)
[2] Nagy, R. et al. Nature Communications. 10.1 (2019): 1-8.
[3] Widmann, M. et al. Nature Materials. 14, 164–168 (2015).
[4] Babin, C, et al. Nature Materials. 21, 67–73 (2022).
[5] Lukin, D.M. et al. Nature Photonics. 14, 330–334 (2020).