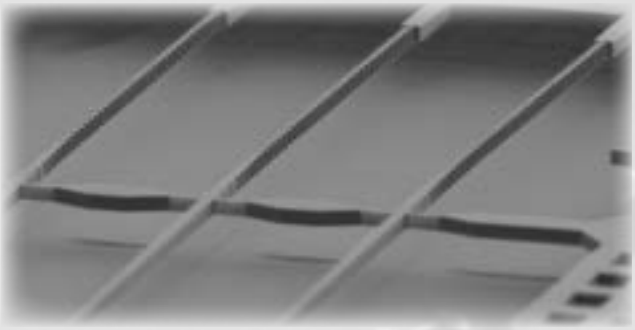
Open positions for master thesis project:

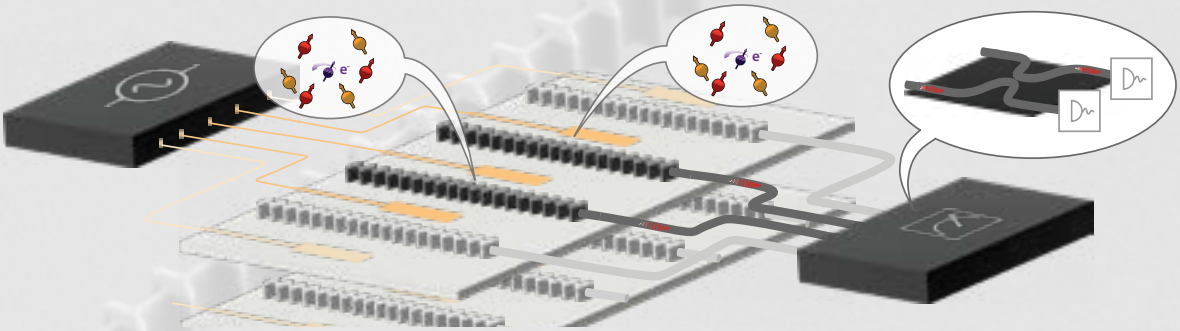
Integration, creation and control of colour centres in nanophotonic devices for scalable quantum networks

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.

1. **Fabricate** and **integrate** qubits in **Photonic Crystal Cavities** in 4H-SiC.
2. **Simulating** a hetronuclear crystal and work towards electron and nuclear **spin control.**
3. Establish **experimental** capability of fiber coupling at **cryogenic temperatures.**

Interested?

Contact: Laurens Feije
or Jasper Hu

[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).