Semiconductor nanowires for hole-spin qubits and THz photodetection applications

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Semiconductor nanowires are one-dimensional structures with a tailored diameter. Traditionally, they have been obtained in a free-standing manner employing the vapor-liquid-solid mechanism. Recently, selective area epitaxy has emerged for the creation of nanowire structures and networks directly on the device substrate [1]. The basic principle of SAE is the direct growth on regions of a substrate, the rest being masked by a 'non-sticking' material such as SiO_2 or SiN. SAE of nanowires can be realized for a wide range of materials and using both molecular beam epitaxy and metalorganic chemical vapor deposition.

In this presentation we will present progress on the SAE of Ge nanowire heterostructures in views of applications in hole-spin qubits [2]. In particular, we will show how the design of the epitaxial template is key to engineer the carrier density and mobility and to obtain coherent electronic transport.

The second part of the presentation will contain the progress towards the use of SAE InGaAs nanowire networks for the creation of THz photodetectors [3] as well as perspectives for THz polarization sensitive imaging [4].

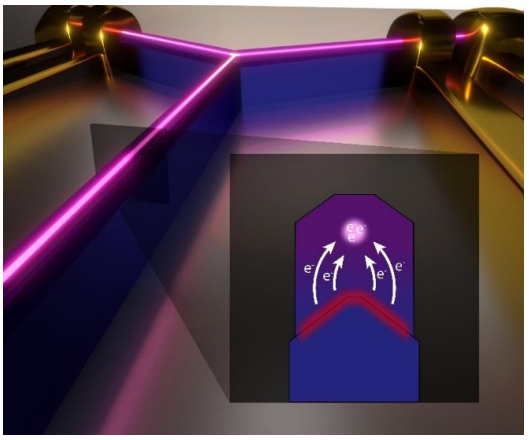

Fig.1. Sketch of a nanowire branched device with a one-dimensional electron channel. Courtesy of L. Güniat and M. Friedl.

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References

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