

Master Thesis:

Simulation, design and characterization of metamaterial-coated SiN waveguides for second-harmonic generation

The silicon nitride (SiN) photonic platform has become one of the mainstays of integrated optics in the visible spectral range. Unfortunately, the implementation of second-order nonlinearities remains challenging due to the centro-symmetry of the SiN crystal lattice. As a consequence, second-order nonlinear devices such as sum- or difference-frequency generators, optical parametric amplifiers or entangled photons generators for quantum optics are still not available on the SiN platform.

Our approach to tackle this challenge is to coat SiN waveguides with a novel second-order nonlinear nanolaminate metamaterial. In a first proof-of-principle experiment we want to demonstrate second-harmonic generation in the metamaterial-coated SiN waveguide.

Your tasks:

- Simulation of SiN waveguides for phase matching of the fundamental and second-harmonic waves
- Design of layouts for SiN chips
- Optical characterization of fabricated devices

For detailed information contact:

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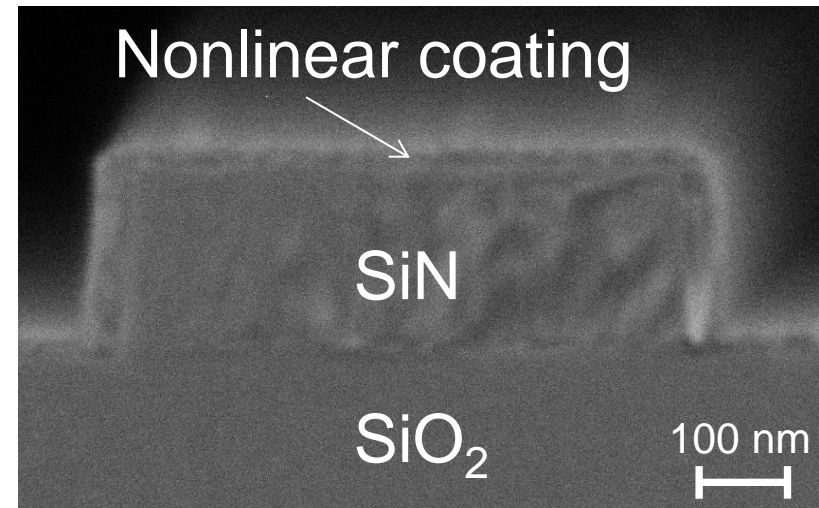
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SEM micrograph of cross section of a coated SiN waveguide