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### New Developments in Solid State Physics

## Abstract Book

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## Fabrication of ZnO/ZnMgO-based optoelectronic devices

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Zinc oxide based devices are rather new to the field of optoelectronics and have recently attracted much interest due to their high LO phonon energy ( $E_{LO} \sim 72$  meV), which can allow to surpass limitations of state-of-the-art GaAs-based devices. The latter, e.g. when realized as THz quantum cascade lasers (QCLs), are currently limited to operation temperatures around 210 K [1-2]. In contrast, room temperature devices would be suitable for many applications like spectral imaging [3], medical diagnostics [4] and trace gas spectroscopy [5].

Here we show the full fabrication process of double-metal waveguides, which is a typical design for THz QCLs, processed into Zn(Mg)O QCL structures. This includes the following processing steps: the development of a CH<sub>4</sub>-based reactive ion etching process yielding smooth vertical sidewalls including an additional passivation for preventing surface leakage currents, a thermo-compression bonding ("wafer bonding") process with a substrate removal procedure with micrometer precision and the fabrication of low-resistance Ohmic contacts. In addition, we present first photoluminescence measurements from Zn(Mg)O-based QCL structures at liquid nitrogen temperatures and above.

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