Cu-doped GaN

P. R. Ganz[1,*], G. Fischer[2], C. Sürgers[3], and D. M. Schaadt[1]

[1]*DFG-Center for Functional Nanostructures (CFN) and Institut für Angwandte Physik, Karlsruhe Institute of Technology (KIT), 76131 Karlsruhe, Germany*
[2] *Physikalisches Institut, Karlsruhe Institute of Technology (KIT), 76131 Karlsruhe, Germany*
[3] *DFG-Center for Functional Nanostructures (CFN) and Physikalisches Institut, Karlsruhe Institute of Technology (KIT), 76131 Karlsruhe, Germany*

Nitride based spintronic is emerging as an interesting alternative to arsenide based spintronic. Group-III nitride semiconductors cover a large bandgap-area and have good thermal and chemical stability and are therefore interesting for all optoelectronic devices. One reason for the strong interest on using Group-III nitrides in spintronic is the long and temperature independent spin-lifetime in InN quantum dots. [1, 2] For spin-injection into these quantum dots, a ferromagnetic spin-aligner which yields high spin-polarization at room-temperature is necessary. The most promising candidates for such a ferromagnetic layer are diluted magnetic semiconductors (DMS), which possesses ferromagnetism by replacing a small amount of group-III elements by transition metals. The non-magnetic dopand copper is a promising candidate, because confusing results due to magnetic clusters, as in the case of Manganese or Gadolinium doped nitrides, were avoided. Theoretical predictions show a maximal spin-polarization of 100% and a high Curie-temperature above 350K [3]. A few experimentals results have indicated ferromagnetism in Cu-doped nitrides.

We investigated and optimized the growth of Cu-doped GaN by plasma assisted molecular beam epitaxy on *C*-plane sapphire substrates. The influences of growth parameters such as growth temperature, Cu to Ga flux ratio and Ga to nitrogen flux ratio on the structural and magnetic properties were analyzed.

All samples were grown nearby the stoichiometric composition to obtain flat films as determined during growth by reflection of high-energy electron diffraction (RHEED). Only the Cu doping level was varied up to a Cu to Ga flux ratio of 5%. The samples show ferromagnetic behavior far above room-temperature, which was indicated by superconducting quantum interference devices (SQUID), and are therefore promising candidates for further spintronic applications.

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* P. Ganz, e-mail: philipp.ganz@kit.edu