Non-equilibrium Polaritonics - Non-linear Effects and Optical Switching — Regine Frank, Jörg Rudolph, Dominique Bougeard, Martin Stutzmann, Rudolph Wieck, Daniel Hägeli

Electron spin dynamics in Gd-implanted GaN — Jörg Rudolph, Martin Stutzmann, Rudolph Wieck, Daniel Hägeli, Regine Frank

Exchange Interaction of Phosphorus Donors and Interface Defects at the Si/SiO2 Interface — Max Suckert, Felix Hoehn, Lukas Drehen, Hans Hübner, Martin Stuttzmann, Martin S. Brandt, Walter Schottky Institut, Garching, Germany — Walther-Meißner-Institut, Garching, Germany

Dilute magnetic semiconductors (DMS) are a prerequisite for the development and realization of spin-based electronics. GaN-based DMS have attracted strong interest in the last years, with a special focus on Gd-doped GaN after reports of ferromagnetism with Curie temperatures far above room-temperature. Experimental evidence for high-temperature ferromagnetism in Ga:GaN was, however, always based on integral measurements of the magnetization by SQUIDs, while complementary methods like x-ray magnetic dichroism or magnetic resonance techniques could not corroborate the claimed ferromagnetism. We measure the electron spin dynamics in GaN implanted with different Gd densities as well as coimplanted with Si by time-resolved magnetooptical Kerr-rotation spectroscopy. We find strongly increased electron spin lifetimes for an intermediate Gd concentration. This strong increase is, however, shown to be a consequence of the high defect density created during the ion implantation, and not a consequence of a magnetic effect of the Gd ions.

The total spin Hall conductivity, which we compare to both theory and experiment, is not be treated as fully independent of the conductivity of the channel. The method involves the formation of spin pairs whose symmetry is of particular interest for the electrical readout mechanism allowing for the detection of coherent spin manipulation of the 31P and decoherence introduced by the P31 to the 31P spins. By modelling the exchange interaction numerically and comparing the result to the EDDEER time evolution, we assign the typical coupling strength of 200 kHz observed to a distribution of 31P-P31 spin pairs with distances in the range from 14 to 20 nm.

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