Poster Session C

Poster C

P-C.196

Integration of molecular quantum bits with semiconductor spintronics

M. Kern, S. Bechler, H. S. Funk, M. Winkler, D. Weißhaupt, I. A. Fischer, S. Ludwigs, J. Schulze, J. van Slageren

Text Molecular nanomagnets hold great promise for quantum computing, as they have been shown to exhibit coherence times from tens of microseconds up to almost a millisecond. The molecular nature of these systems offers the possibility for extended chemical tailoring for higher coherence times or surface self-assembly.

To address the molecules, we plan to use spin polarized charge carriers in a spin valve geometry with various spin transport possibilities to programme/readout the quantum state of the qubits. We will try to interface these molecules with spin polarized carriers in Ge channels, in organic layers and in organic single crystal magnetic conductors. For the first option, we have already started to study spin injection into Ge channels from Mn_5Ge_3 ferromagnetic electrodes via the Hanle effect. We have developed a novel, CMOS compatible manufacturing possibility of the ferromagnetic electrodes and prepared 4-terminal structures. We have used these structures to study spin transport in highly doped Ge channels and observed spin injection up to 36 K. Next step will be combining this technology with molecular quantum bits.

To investigate the possibility of interfacing magnetic molecules with organic semiconductor technology, we are manufacturing hybrid materials made of conducting polymers and molecular qubits. We have successfully observed quantum coherence in the microsecond regime in thin films of these hybrid materials using a custom Fabry-Pérot resonator at 35 GHz.