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Single Spins in Diamond – Novel Probes for Nanoscience GOPALAKRISHNAN BALASUBRAMANIAN, JULIA TISLER, FEDOR JELEZKO, JOERG WRACHTRUP, Universitaet Stuttgart — Nitrogen-Vacancy color centers in diamond are gaining popularity because of its exceptional optical and spin properties. The single spin of the defect can be manipulated optically, providing an efficient way to entangle single electron spins and couple nuclear spin qubits in diamond. Long spin coherence time of these single defects finds application as sensitive magnetic field probes. Using engineered diamond we achieve ultrahigh sensitivity, which offers us possibilities to detect single external electron or nuclear spin. Broad emission/excitation spectrum and point like nature of the NV defects are attractive features in using them as FRET fluorophore. Attaching the emitter to the tip of a scanning probe microscope we were able to construct a scanning FRET microscope and image single molecules under ambient conditions. By attaching these single spins sensors to the tip of a scanning probe, we were able to perform sensitive scanning probe magnetometry at nanoscale.[1] Improving this device by using quantum grade diamond and synchronized NMR pulse sequences we would have the ability to perform nanoscale NMR/MRI of a single molecules. The method has far reaching potential in solving structure of biomolecules under ambient conditions. [1] Balasubramanian, G. et al. Nanoscale imaging magnetometry with diamond spins under ambient conditions. Nature 455, 648-651(2008).

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