Probing and imaging nanoscale magnetism with scanning magnetometers based on diamond quantum defects

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Probing and imaging magnetismat nanometer scale is of great interest in a wide range of fields, including solid-state physics, materialsscience andbiomedical applications. Simultaneously satisfyinghigh spatial resolution andhigh fieldsensitivity, however, requires development of novel magneticsensors. The nitrogen-vacancy (NV) defect center in diamondhas promising potential for nanometerand nanoteslamagnetometrydue to its atomic-scalesize, long spin coherence timesand high magnetic field sensitivity (e.g. < $nT/Hz^{1/2}$). Since these properties are robust against a wide range of operating temperature, it is also suitableforstudyingnovel magnetic materials exhibiting temperature-dependent magnetic orders. Furthermore the defect can be integrated into AFM(atomic forcemicroscope)type scanning probesproviding imaging capability of nanoscale magnetism. In this talk, Iwill introduce the conceptandworking principle of the novel technique. I will also present recent progress in the fieldand research plans at Korea university.