Quantum sensing of magnetic fields with molecular color centers

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New metrologies for magnetic field sensing are needed to understand the spatial dependence of magnetic fields from magnetic materials such as two-dimensional (2D) magnets. Molecular color centers, including Cr(o-tolyl)4, show promise as an adaptable platform for addressing these challenges. Here I present discuss our recent models, utilizing density functional theory and magnetostatic calculations, to show how Cr(o-tolyl)4 could be used as a quantum magnetic field sensor. We apply these models to a monolayer of CrI3 to computationally predict the magnetic fields the molecular color center would detect from a 2D ferromagnet. Our models effectively demonstrate how a molecular color center could be used to measure the magnetic field of a 2D magnet and the role different distance-dependent interactions contribute to the measured field. Our results show how molecular color centers can be used to sense magnetic fields with high fidelity over a range of distances, and how the platform forms a novel metrology to discern phenomena in low dimensional systems.