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Mapping Nanomagnetic Fields Using a Radical Pair Reaction[1]
HOHJAI LEE, Department of Chemistry and Chemical Biology, Harvard University, NAN YANG, School of Engineering and Applied Sciences, Harvard University, ADAM COHEN, Department of Chemistry and Chemical Biology and Department of Physics, Harvard University — We visualized the magnetic field around ferromagnetic nanostructures using a combination of a standard epifluorescence microscope and a fluorescence chemical indicator of magnetic field (H. Lee et al., Nano Lett. DOI: 10.1021/nl202950h). The indicator was a chain-linked electron donor-acceptor molecule, phenanthrene-$(CH_2)_{12}$-O-$(CH_2)_2$-dimethylaniline, that forms spin-correlated radical pairs upon photoexcitation. The magnetic field altered the coherence spin dynamics, yielding an 80% increase in exciplex fluorescence in a 0.1 T magnetic field. The magnetic field distributions were quantified to precision of 1.8×10^{-4} T by image analysis and agreed with finite-element nonmagnetic simulations.

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