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Hybrid diamond-doped optical fibres for remote magnetometry applications

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Abstract

The ability to persistently monitor weak magnetic fields is a key objective in long-term surveillance. One approach to meeting this goal is the development of optical fibre-based magnetometers capable of remote operation. Diamond containing the negatively-charged nitrogen vacancy colour centre (NV) is emerging as an important system for the sensing of various physical parameters including magnetic field and temperature. Many existing diamond NV magnetometers require complex microscopes to monitor the fluorescence signal, which can restrict NV to laboratory settings. Here I will discuss the fabrication and characterization of an intrinsically magneto-sensitive optical fibre with potential applications as a high-efficiency remote magnetic sensing platform. The hybrid fibre allows for optical interrogation of NV-spin states via bound modes in a highly-stable waveguide structure. Our results open the possibility of robust, field-deployable fibre optical magnetometry for a broad range of quantum sensing applications.