

Optically pumped magnetometers for material research applications

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Optically pumped magnetometers (OPMs) offer a unique combination of high sensitivity, miniaturization and simplicity of operation paired with high sensitivity in the range of $15 \text{ fT}/\sqrt{\text{Hz}}$ at room temperature [1]. These are good preconditions to expand state-of-the-art optical or magnetic methods in materials research towards smaller microstructural defect analysis. The QMAG project aims to build a first demonstrator for materials research applications using OPMs to detect and analyze material defects in the micrometer range as they are caused by hydrogen embrittlement in steel [2]. The sensor development and data evaluation will be accompanied by numerical solid mechanics simulation at the Materials Design department of Fraunhofer IWM [3].

References

- [1] <https://quspin.com/>
- [2] Di Stefano, D.; Nazarov, R.; Hickel, T.; Neugebauer, J.; Mrovec, M.; and Elsässer, C.: First-principles investigation of hydrogen interaction with TiC precipitates in α -Fe. PHYSICAL REVIEW B93, 184108 (2016).
- [3] Fraunhofer Institute for Mechanics of Materials IWM, <https://www.iwm.fraunhofer.de/en/services/materials-design.html>