YBCO SQUIDs for High-Frequency Magnetic Particle Characterization

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Exploring the characteristics of nanostructured magnetic materials is of great interest for investigating fundamental aspects of quantum magnonics and their application in cutting-edge quantum information technologies. To do this, the development of highly responsive magnetic sensors capable of handling radio frequency (RF) signals is needed. Such sensors, known as Superconducting Quantum Interference Devices (SQUIDs), have typically been used in DC applications due to specific amplification constraints limiting signal frequencies. However, the potential for SQUID utilization in RF signals exists, given the persistence of the Josephson effect at these frequencies. Here, we propose the fabrication of SQUIDs designed for high-frequency operation, particularly for their application in quantum magnonics experiments.
To this end, we propose the fabrication of SQUIDs based on grain boundary Josephson junctions in YBCO, a high-temperature superconductor, on a MgO substrate. These SQUIDs present exceptional sensitivity, low inductance, minimal noise, and a high critical current density.

References

[1] M. J. Martínez-Pérez et al 2017 Supercond. Sci. Technol. 30 024003.

Acknowledgements

This work was partly funded and supported by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (948986 QFaST) and the Juan de la Cierva 2022 grant of the Agencia Estatal de Investigación (AEI) of the Spanish Ministry of Science, Innovation and Universities.
Authors would like to acknowledge the use of Laboratorio de Microscopias Avanzadas-LMA and Servicio General de Apoyo a la Investigación-SAI, Universidad de Zaragoza.

Figures

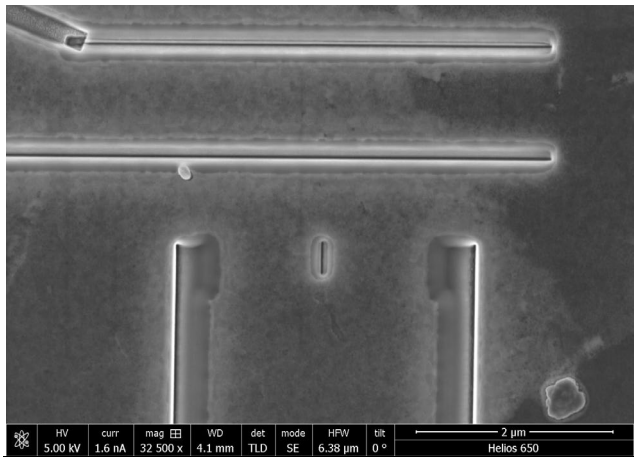

Figure 1: Detail of a YBCO SQUID with external flux line).