

Characterising Superconductivity in mesoscopic and bulk systems using Muon Spin Rotation

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Muons are a highly sensitive probe of local magnetic effects in condensed matter systems, which can be used to characterise the behaviour of a range of different material classes such as frustrated magnets, battery materials and superconductors [1]. Here, I will provide a brief overview of the muon technique and its application to superconductivity, before discussing two recent results on (i) spin-orbit driven superconducting proximity effects in artificial heterostructures, where a strong spin-orbit interaction was found to promote the generation of unconventional superconducting pairs in a conventional thin-film superconductor [2], and (ii) high entropy alloy superconductivity in equiatomic hexagonal Nb-Mo-Ru-Re-Ir as characterised using muon spin rotation [3]. In both cases muons have provided a unique insight into the nature of the superconductivity.

References

- [1] A. D. Hillier, S. J. Blundell, and I. McKenzie et al. *Nature Reviews Primers*, 2022.
- [2] M. G. Flokstra, R. Stewart, and CM. Yim et. al. *Nature Communications*, 2023.
- [3] S. Jangid, R. Stewart, A. D. Hillier, and R. P. Singh. *In. Preparation*, 2024.