Fabrication of Nb SQUIDs using a Pt protective layer deposited with FEBID

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Superconducting quantum interference devices (SQUIDs) combine the effects of flux quantization and Josephson tunnelling, making them highly responsive to fluctuations in magnetic fields. Their quantum properties play a key role in advancing emerging quantum technologies, particularly in sensing and computing applications.
These devices can perform highly sensitive magnetic flux measurements across a wide range of frequencies, particularly at low temperatures. As a result, they are commonly used in amplifiers, magnetometers, and gradiometers for quantum sensing. Moreover, thanks to their tuneable inductance, SQUIDs are well-suited as couplers to regulate interactions between various components, such as qubit-qubit or qubit-quantum bus interactions.
Here, we propose the fabrication of Nb-based Josephson nanobridges. A Si substrate with Nb deposited by sputtering.
The patterns were defined using Ga^+ FIB, and for the most delicate patterning, that is, the Josephson Junctions, a Pt protective layer was deposited using FEBID before the attack.

References

[1] J. Clarke, A. I. Braginski (Eds.), The SQUID handbook, 17-21 (2004).
[2] O.W. Kennedy, et. al. Phys. Rev. Appl., 11, 014006, (2019).

Figures

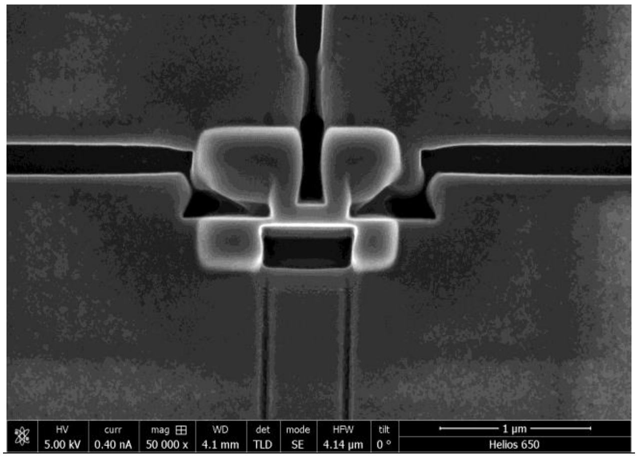

Figure 1 Caption of a SQUID fabricated with the proposed method.

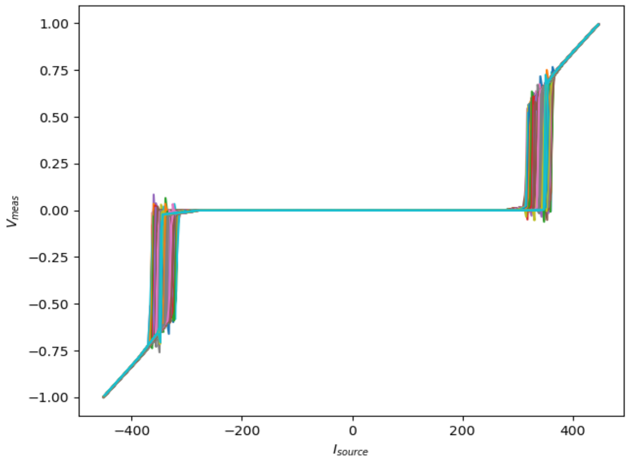

Figure 2 IV-characteristic at different modulation currents.

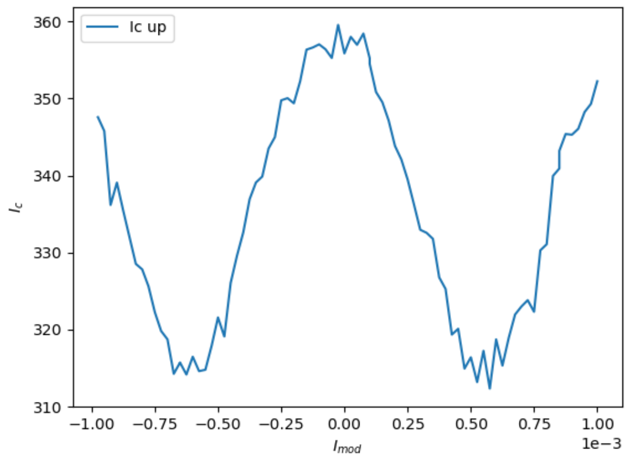

Figure 3 Critical current over modulation current.