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Enhancing superconducting radio-frequency performance with high-throughput method-assisted FeSe1-xTex coated Nb films

Thursday 25 September 2025 14:30 (3 hours)

Bulk Nb superconducting radio-frequency (SRF) cavities are widely utilized in particle accelerators, however, their accelerating gradient and overall performance are limited by the superheating field (Bs). To overcome this theoretical limit, we aim to develop innovative multilayer structures. Iron-based superconductors are considered promising coating materials for such multilayer structures, however, detailed studies on this topic remain scarce. In this research, we fabricated FeSe1-xTex-coated Nb planar films and characterized their structural, electrical transport and magnetic properties to explore the feasibility of this superconductor-superconductor bilayer. To efficiently identify the optimal Te doping level, advanced high-throughput film synthesis techniques were employed to fabricate composition-spread FeSe1-xTex film (x = 0 - 1) on a piece of Nb film, followed by micro-region structural and transport characterizations. The results demonstrate that under optimal doping, the Bc1 of FeSe1-xTex coated Nb films is significantly enhanced, while its Tc is comparable to that of bulk Nb. Through high-throughput methods, this work provides valuable technical parameters and insights into vortex penetration behavior, laying the foundation for the development of future SRF cavities based on iron-based superconducting films.

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Yes

Footnotes

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