Josephson and noise scanning tunneling microscopy on conventional, unconventional and disordered superconductors

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Stellingen

Behorende bij het proefschrift

“Josephson and noise scanning tunneling microscopy on conventional, unconventional and disordered superconductors”

1. The electric field of a scanning tunneling microscope probe can be used in order to tune the energy of magnetic impurity states in Fe(Se,Te) as its low carrier density allows the field to penetrate in its interior. (Chapter 4 of this thesis)
2. There exist paired electrons in the disordered superconductor TiN in a metallic state above its critical temperature. (Chapter 6 of this thesis)
3. The fact that prominent effects such as the chemical disorder and the inter-pocket quasiparticle scattering do not influence the superfluid indicates that the inhomogeneity in the superfluid density in Fe(Se,Te) is intrinsic. (Chapter 3 of this thesis)
4. Disruptions in the superfluid, due to local confinement of the charge carriers or scattering on non-magnetic centers, on length scales smaller than the superconducting coherence length, do not influence the charge pairing, since the spatially resolved current noise is unaffected. (Chapter 5 of this thesis)
5. Performing noise scanning tunneling microscopy in the vortex core of Fe(Se,Te) would allow to distinguish between Majorana and trivial bound states as proposed by Bolech and Demler in Phys. Rev. Lett. 98, 237002(2007).
6. Josephson scanning tunneling microscopy would be valuable for verifying the presence of superconducting pair density waves in strained graphene (Phys. Rev. B 98, 205103 (2018)).
7. Josephson scanning tunneling microscopy could further corroborate the emergence of electronic granularity in two-dimensional systems close to the superconductor-insulator transition (Phys. Rev. B 93, 144509 (2016)).
8. Automating the procedure of making a superconducting tip through indentation into a Pb surface by using machine learning algorithms as in ACS Nano 2018, 12, 6, 5185–5189, would increase the yield and save valuable time.
9. Scientists should promote open science by publishing their work in open access journals managed by professional scientists.

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