Title and Abstract:

Inverse melting of the vortex lattice in a superconducting thin film

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When temperature is increased most solids melt into a liquid at a characteristic temperature. There are however rare situations where temperature can induce a transformation from a liquid to a solid. This phenomenon, called inverse melting, is only observed in a handful of systems. Here analysing real space images of the vortex state using a scanning tunneling microscope, I will show the observation inverse melting of the vortex lattice in a 20 nm thick Re6Zr thin film where the vortices transform from an inhomogeneous liquid to a solid and then back to a liquid when temperature or magnetic field increased. These transformations leave distinct signatures on the magnetotransport properties of the superconductor.

Ref:
Duhan, R., Sengupta, S., Jesudasan, J. *et al.* Inverse melting and re-entrant transformations of the vortex lattice in amorphous Re_6Zr thin film. *Nat Commun* 16, 2100 (2025).