Upper critical field of Sr_2RuO_4 under uniaxial stress

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Using piezoelectric-driven uniaxial pressure apparatus, the lattice of the unconventional superconductor Sr_2RuO_4 can be compressed by, so far, up to ~1%. We have shown that as Sr_2RuO_4 is compressed along a <100> lattice direction T_c passes through a pronounced peak at about 0.6% compression, where it is more than twice as high as at zero strain, then falls rapidly. At this peak, the upper critical field H_{c2} is enhanced by a factor of ~20. This enhancement of the superconductivity is most likely driven by tuning one of the Fermi surfaces through a Van Hove singularity in the density of states. Here, we present data on H_{c2} at intermediate strains. For technical reasons, to do this measurement it was necessary to improve the sample quality and improve the spatial resolution of the measurement to overcome the challenge of strain inhomogeneity at intermediate strains. We show that the peak in H_{c2} is much sharper than that in T_c, a fact that provides further information on how the superconducting gap evolves as the Van Hove singularity is approached.

[1] Hicks et al., Science 344, 283 (2014)
[2] Steppke et al., Science 355, 148 (2017)