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Quantum creep in a highly crystalline two-dimensional superconductor YU SAITO, The University of Tokyo, YUICHI KASAHARA, Kyoto University, JIANTING YE, University of Groningen, YOSHIHIRO IWASA, The University of Tokyo, TSUTOMU NOJIMA, Tohoku University — Conventional studies on quantum phase transitions, especially on superconductor-insulator or superconductor-metal-insulator transitions have been performed in deposited metallic thin films such as Bismuth or MoGe. Although the techniques of thin films deposition have been considerably improved, unintentional disorder such as impurities and deficiencies, generating the pinning centers, seems to still exist in such systems. The mechanical exfoliated highly crystalline two-dimensional material can be a good candidate to realize a less-disordered 2D superconductor with extremely weak pinning, combined with transfer method or ionic-liquid gating. We report on the quantum metal, namely, magnetic-field-induced metallic state observed in an ion-gated two-dimensional superconductor based on an ultra-highly crystalline layered band insulator, ZrNCl [1]. We found that the superconducting state is extremely fragile against external magnetic fields; that is, zero resistance state immediately disappears, once an external magnetic field switches on. This is because the present system is relatively clean and the pinning potential is extremely weak, which cause quantum tunneling and flux flow of vortices, resulting in metallic ground state. [1] Y. Saito et al. Science 350, 409-413 (2015).

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