Growth and Characterization of 2D superconductor $NdO_{0.5}F_{0.5}BiS_2$

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We present a combined growth and characterization study of single crystalline superconductor $NdO_{0.5}F_{0.5}BiS_2$. Large high-quality single crystals were grown by flux method, and the sample was characterized by transport measurements and high energy XRD. The crystal structure with bi-layers BiS_2 separated by $NdF_{0.5}O_{0.5}$ layers makes a potential host for two-dimensional superconductivity. The 2D superconductivity is confirmed with non-linear VI characterization and standard 2D superconducting fluctuations.

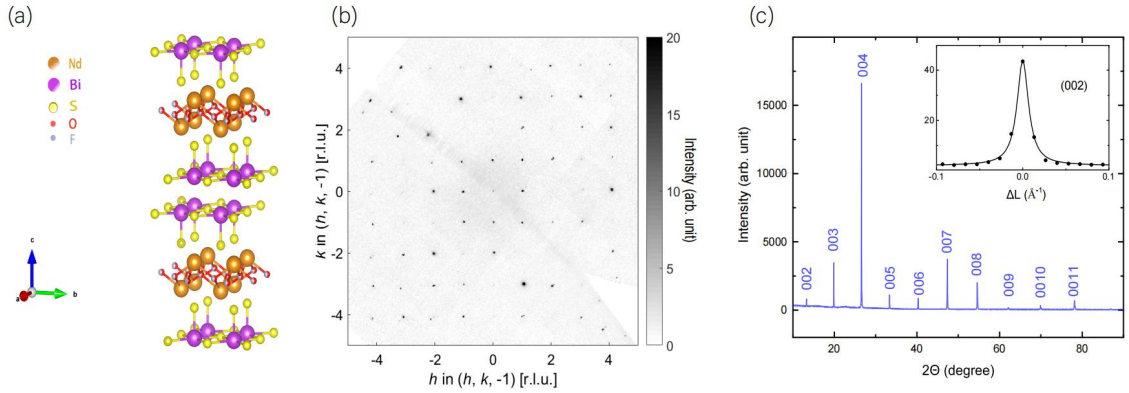

Fig.1 (a) shows the layered crystal structure of $NdO_{0.5}F_{0.5}BiS2$. (b) Representative high-energy (100 keV) XRD mapping of the Bragg reflections in the (h, k, −1) plane. (c) XRD pattern of a $NdO_{0.5}F_{0.5}BiS_2$ single crystal measured with copper Kα x-rays.

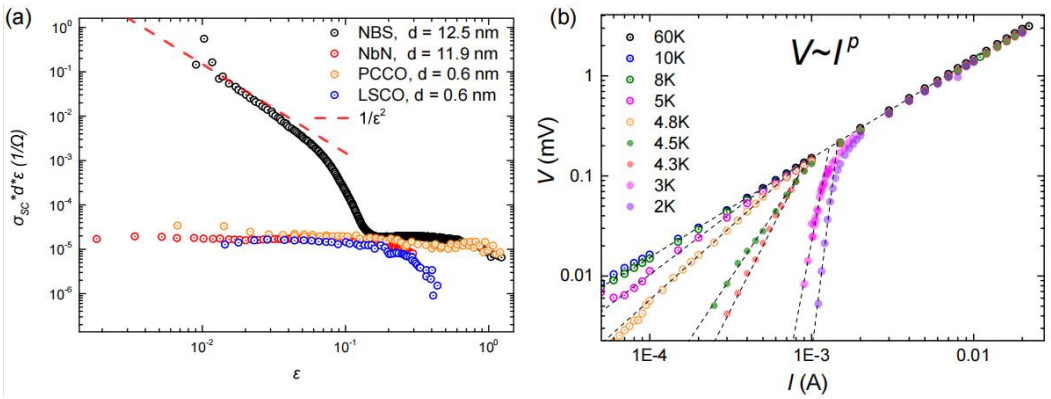

Fig.2 (a) compares superconducting fluctuations in the form of $\sigma_{sc}*d*\varepsilon$ versus $\varepsilon = (T-T_c)/T_c$ for $NdO_{0.5}F_{0.5}BiS_2$, $Pr_{2-x}Ce_xCuO_4$ [1], $La_{2-x}Sr_xCuO_4$ [2], and NbN [3] . (c) VI curves in log-log scale for different temperatures as indicated.

[1] F. F. Tafti et al. Phys. Rev. B 90, 024519 (2014).
[2] S. R. Curras et al. Phys. Rev. B 68, 094501 (2003).
[3] D. Destraz, K. Ilin, M. Siegel, A. Schilling, and J. Chang, Phys. Rev. B 95, 224501 (2017)