Temperature Dependence of Upper Critical Field and Its Anisotropy Ratio of $SmFeAsO_{0.85}$ and $SmFeAsO_{0.8}F_{0.2}$ Single Crystals

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We investigated temperature dependence of upper critical fields ($H_{c2}(T)$) and its anisotropy of F-free $SmFeAsO_{0.85}$ and F-doped $SmFeAsO_{0.8}F_{0.2}$ single crystals, grown at high pressure with a nominal composition, by measuring resistive transition in static and pulsed magnetic fields up to 7 T and 60 T, respectively. $H_{c2}(T)$ for the field parallel to c-axis ($H_{c2//c}(T)$) and *ab*-plane ($H_{c2//ab}(T)$) obtained in both single crystals exhibited the behavior similar to those of $AEFe_2As_2$ (AE=alkali earth) series, i.e., a linear increase of $H_{c2//c}(T)$ and a sublinear increase of $H_{c2//ab}(T)$ with decreasing temperature below the superconducting transition, which is in contrast to the result reported in $NdFeAsO_{1-x}F_x$ single crystals. Fermi-surface topology as well as paramagnetic pair-breaking effect is responsible for the field-orientation-dependent behavior of $H_{c2}(T)$. In addition, anisotropy ratio of $\gamma(T) = H_{c2//ab}/H_{c2//c}(T)$ tells the existence of a multi-band nature.

Keywords: FeAs-based superconductor, Iron pnictides single crystal, Upper critical field, Anisotropy