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Reversal of the Upper Critical Field Anisotropy and Spin-Locked Superconductivity in $K_2Cr_3As_3$ FEDOR F. BALAKIREV, Los Alamos National Laboratory, TAI KONG, Ames Laboratory, Iowa State University, MARCELO JAIME, ROSS D. MCDONALD, CHARLES H. MIELKE, Los Alamos National Laboratory, ALEXANDER GUREVICH, Old Dominion University, PAUL C. CANFIELD, SERGEY L. BUD'KO, Ames Laboratory, Iowa State University — We report the first measurements of the anisotropic upper critical field $H_{c2}(T)$ for $K_2Cr_3As_3$ single crystals up to 60 T and T>0.6K. $H_{c2}(T)$ was determined via resistivity and proximity detector oscillator techniques. Our results show that the upper critical field parallel to the Cr chains,$H_{c2\|}$, exhibits a paramagnetically-limited behavior, whereas no evidence of paramagnetic pair breaking was observed with field perpendicular to the Cr chains. As a result, the curves $H_{c2\perp}$ (T) and $H_{c2\|}$ (T) cross at T˜4 K, so that the anisotropy parameter $\gamma(T) = H_{c2\perp}$ /$H_{c2\|}$ increases from γ˜0.35 near T_c to γ˜1.7 at 0.6 K. This behavior of $H_{c2}(T)$ is inconsistent with triplet superconductivity but suggests a form of singlet superconductivity with the electron spins locked onto the direction of Cr chains.

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