Anisotropic Superconducting Phase Diagram of C₆Ca

ULRICH WELP, R. XIE, D. ROSENmann, A. RYDH, H. CLAUS, G. KARAPETROV, W. K. KWOK, Materials Science Division, Argonne National Laboratory, Argonne, IL 60439 — We present a study of the anisotropic superconducting phase diagram of the new carbon intercalation superconductor C₆Ca employing magnetization and specific heat measurements. The intercalation of Ca into flakes of natural graphite takes place through vapor transport at temperatures near 500 °C. The resulting crystals display an onset of superconductivity at 11.3 K and a transition width of about 1 K as seen in heat capacity and low-field magnetization measurements. A clear step in the heat capacity confirms the bulk nature of the superconducting state. Roughly 1/3 to 1/2 of the sample volume is superconducting as evidenced by the reduced step height of the heat capacity. From measurements of the upper critical field, \( H_{c2} \), we determined an in-plane coherence length of \( \xi_{ab} \approx 36 \) nm. The angular dependence of \( H_{c2} \) is well described within the model of effective mass anisotropy yielding an anisotropy parameter of \( \Gamma \approx 3.5 \) to 4.

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