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High current stability and sharp $E(J)$ curves in high- J_c polycrystalline MgB_2 films¹ J.R. THOMPSON, K.D. SORGE, University of Tennessee and Oak Ridge National Lab, C. CANTONI, D.K. CHRISTEN, M. PARANTHAMAN, Oak Ridge National Lab — We investigated vortex pinning in high- J_c films of polycrystalline MgB_2 through study of the dependence of current density J on electric field E using magnetic and transport methods. Films of amorphous boron on sapphire were converted to 0.6 μm thick MgB_2 by post-annealing in Mg vapor at 890 °C for 2 h. A SQUID magnetometer was used conventionally to determine the induced current density by the Bean model. To monitor the decay of J with time t , the sample was fixed in the center of the pickup coils, and the SQUID feedback voltage $V \propto J$ was measured versus time. The logarithmic decay rate $S = -\text{dln}(J)/\text{dln}(t)$ is very low in the H - T phase space away from the irreversibility line. Transport studies of $E(J)$ are analyzed as a power law with $E \propto J^n$, where the exponent $n = (1 + S)/S$. Effective values for n approach and sometimes significantly exceed 100. These results will be contrasted with the much more rapid decay typically observed in high- T_c and some conventional superconductors.

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