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Measurements of Resonant Activation and Multiple Gap Structure in MgB2 Thin Film Josephson Junctions near 1 Kelvin ROBERTO RAMOS, Indiana Wesleyan University, STEVEN CARABELLO, JOSEPH LAMBERT, JEROME MLACK, Drexel University, DANIEL CUNNANE, Temple University, WENQING DAI, Penn State University, C.G. ZHUANG, YI SHEN, KE CHEN, Temple University, QI LI, Penn State University, X.X. XI, Temple University — Superconductivity in magnesium diboride (MgB2) is of great practical interest because of its high superconducting transition temperature Tc of 39K and its relatively low cost and relative ease of manufacturing. We report the results of two experiments investigating MgB2-based thin film Josephson junctions fabricated by hybrid physical-chemical vapor deposition (HPCVD). First, Josephson junctions behave like a nonlinear oscillator with a phase particle that can escape the Josephson potential either through thermal activation or quantum tunneling. We report results of our thermally- and microwave-assisted resonant activation experiments. We see evidence of a resonant peak, in addition to the primary escape peak, consistent with theoretical predictions. We have also conducted low-temperature tunneling spectroscopy studies of MgB2 that confirm substructure within both energy gaps of MgB2, in agreement with theoretical predictions.

Roberto Ramos
Indiana Wesleyan University

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