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Properties of Nb-$MoSi_2$-Nb Josephson Junctions YONUK CHONG, PAUL D. DRESSELHAUS, SAMUEL P. BENZ, National Institute of Standards and Technology, Boulder, CO — We report a detailed study on the physical properties of Nb-$MoSi_2$-Nb Josephson junctions. $MoSi_2$-barrier junction turned out to be an excellent model system to study proximity-coupled Josephson junctions with rigid S/N boundary, in that it enables independent, good controls of the two relevant variables, the barrier thickness and the temperature. In addition, it can be tuned in a wide range of characteristic voltage with reasonable critical current density. These junctions have already been successfully applied to high-performance fast-programmable voltage standards with more than 100,000 junctions on a chip in the form of stacked junctions. The characteristic voltage is highly controllable, and shows exponential dependence on the barrier thickness at 4 K. The temperature dependence of the critical current density is well fit to the proximity-coupled junction theory, and we could extract relevant material parameters quantitatively.

Yonuk Chong
NIST

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