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M2Or3C-02: Analysis of recrystallization and grain growth behavior in heavily deformed reactor grade (Grade 1) and RRR grade Niobium for SRF and superconducting wire applications

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Niobium used in Nb₃Sn multifilamentary superconductor wire and superconducting radio frequency cavities is initially cast and then receives a series of deformation and annealing steps to bring it to final component dimensions. The intermediate and final annealing steps are applied in order to recrystallize and soften the microstructure for subsequent shaping or additional mechanical deformation. Multiple recrystallizations can give a more uniform finer-grained end point microstructure. Impurity type and content, and level of plastic strain influence the temperature required for recrystallization as well as subsequent grain growth behavior. Therefore, in order to control the final Nb grain size, it is important to know the recrystallization temperature and temperature dependence of grain growth for the Nb being used. The work reported presents recrystallization and grain growth behavior in heavily deformed reactor grade (Grade 1) and RRR grade Nb, and we discuss how this information can be used to optimize the heat treatment and processing of this material.

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