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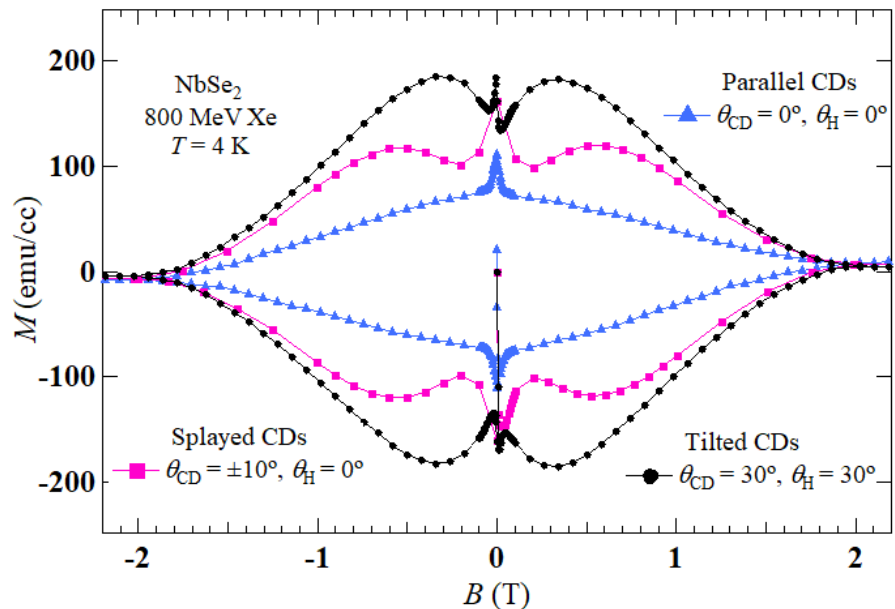
Effects of 800 MeV Xe Irradiation on 2H-NbSe₂ Single Crystals

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Introduction of columnar defects in a clean single crystal of superconductor strongly enhances the critical current density (J_c). This has been confirmed by many experiments [1,2] and explained by theoretical analyses. Several conditions of heavy-ion irradiation, such as the energy, density, and the incident direction of heavy ions strongly affect the structure of columnar defects and enhancement of J_c . An anomalous peak effect has been observed in iron-based superconductors at $\sim 1/3$ of the dose equivalent matching field, $B\Phi$, when the columnar defects are introduced from two symmetric directions with respect to the c -axis at angles of $\sim \pm 20^\circ$ [3]. Actually, a similar peak effect has been observed in YBa₂Cu₃O₇ with tilted columnar defects but with natural splay [1]. Despite these extensive research on iron-based superconductors and cuprate superconductors, there have been few studies on the effect of columnar defects in conventional superconductors. Recently, a peak effect has been observed in NbSe₂, which is a canonical conventional layered superconductor, with tilted columnar defects [4]. To understand how the configuration of columnar defects affects the J_c in NbSe₂, effects of 800 MeV Xe irradiation on NbSe₂ single crystals have been investigated. We introduced three kinds of columnar defects (parallel, tilted, and splayed columnar defects with respect to the c -axis) in NbSe₂ single crystals. Pronounced peak effects in M-H

loops have been observed in the case of samples introduced tilted or splayed columnar defects when the field is applied to the average direction of columnar defects (Fig. 1). It should be noticed that with a large matching field of $B\Phi = 8$ T, the superconducting transition temperature hardly changes. We will discuss the origin of the anomalous peak effect in NbSe₂ with tilted or splayed columnar defects.



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