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M2Or3B-02 [Invited]: Vortex pinning landscape by ion irradiation for REBCO thin films

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Raising critical current density J_c in REBa₂Cu₃O_y (REBCO, RE: Y and rare earth) tapes is very important for applications such as rotation machineries and wind turbines. Many types of nano-sized precipitates and defects have been formed to enhance vortex pinning, resulting in an increase of J_c under magnetic fields. Ion irradiation is a well-established method for artificially introducing a variety of defects into superconductors in a fairly predictable and controllable manner by opting appropriate ion species and energy. Recently, a low-energy ion irradiation has been revisited as a practically feasible approach to enhance vortex pinning in REBCO tapes. Low-energy ion beam (< several MeV) can produce vacancy-interstitial type of defects, including Frenkel pairs and their clusters along cascades. We have demonstrated an enhancement of J_c by using low-energy ion irradiation, in which we created small cascade and cluster-like defects in iron-chalcogenide superconducting films.[1,2] In this talk, we present systematically the effect of low-energy ion irradiation on superconducting properties in REBCO films by means of both transport and magnetization measurements. We also discuss the relationship between the superconducting properties and the microstructures of REBCO films before and after several types of ion irradiations.

- 1) T. Ozaki et al., Nat. Commun. 7, 13036 (2016).
- 2) T. Ozaki et al., Supercond. Sci. Technol. 31, 024002 (2018).

Author: OZAKI, Toshinori (Kwansei Gakuin University)

Co-authors: Prof. SEMBOSHI, Satoshi (Tohoku University); Prof. SUEYOSHI, Tetsuro (Kumamoto University); Dr OKAZAKI, Hiroyuki (Takasaki Advanced Radiation Research Institute, National Institutes for Quantum and Radiological Science and Technology); Dr KOSHIKAWA, Hiroshi (Takasaki Advanced Radiation Research Institute, National Institutes for Quantum and Radiological Science and Technology); Dr YAMAMOTO, Shunya (Takasaki Advanced Radiation Research Institute, National Institutes for Quantum and Radiological Science and Technology); Dr YAMAKI, Tetsuya (Takasaki Advanced Radiation Research Institute, National Institutes for Quantum and Radiological Science and Technology); Dr SAKANE, Hitoshi (SHI-ATEX Co., Ltd.)

Presenter: OZAKI, Toshinori (Kwansei Gakuin University)

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