Contribution ID: **991** Contribution code: **THU-PO3-605-02** Type: **Poster**

Critical current and nano-structural properties of K-doped $BaFe_2As_2$ epitaxial thin films by molecular beam epitaxy

Thursday 18 November 2021 10:00 (20 minutes)

The iron-based superconductor is a promising candidate for applications in polycrystalline forms owing to its high current transport performance under high magnetic fields. Especially, doped-$BaFe_2As_2$ (Ba122) is particularly interesting in terms of both small anisotropy and small weak-link issues [1]. Epitaxial thin films (ETF) of Ba122-type superconductors have been realized only with Co and P doping by both pulsed laser deposition and molecular beam epitaxy (MBE). Hence, extensive research on enhancing critical current density (J_c) has been carried out via introducing artificial pinning centers [2, 3]. However, the fabrication of K-doped Ba122 ETFs has not been realized due to its high volatility and high vapor pressure. Recently, we have succeeded in growing K-doped Ba122 ETFs on CaF_2 substrate with high crystallinity by MBE [4]. In the present study, we will report J_c characteristics and nanostructure of the K-doped Ba122 ETFs. Surprisingly high J_c over 10 MA/cm^2 was observed at 4 K by magnetic measurement. Note that our thin films showed superior superconducting properties to the pinning enhanced K-doped single crystals by ion irradiation [5]. TEM analyses revealed that low-angle grain boundaries developed in the K-doped Ba122 ETFs grown on CaF_2 substrates which could act as flux pinning centers and correspond to the record-high J_c.

This work was partly supported by JST CREST (Grant No. JPMJCR18J4) and Advanced Characterization Platform of the Nanotechnology Platform Japan (Grants No. JPMXP09-A-19-KU-1003 and 1004) sponsored by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan.

[1] H. Hosono *et al.*, Materials Today **21**, 278 (2018).
[2] L. Fang *et al.*, Nat. Commun. **4**, 2655 (2013).
[3] M. Miura *et al.*, Supercond. Sci. Technol. **32**, 064005 (2019).
[4] D. Qin *et al.*, Phys. Rev. Materials **5**, 014801 (2021).
[5] A. Takahashi *et al.*, J. Phys.: Conf. Ser. **1590**, 012015 (2020).

Primary authors: QIN, Dongyi (Tokyo University of Agriculture and Technology); IIDA, Kazumasa (Nagoya University); TARANTINI, Chiara (ASC-NHMFL, Florida State University); Dr HATANO, Takafumi (Japan/Nagoya Univ.); Mr MA, Yiming (Kyushu University); Mr WANG, Chao (Kyushu University); Mrs GAO, Hongye (Kyushu University); Mr GUO, Zimeng (Kyushu University); Prof. SAITO, Hikaru (Kyushu University); Dr HATA, Satoshi (Kyushu University); Prof. NAITO, Michio (Tokyo University of Agriculture and Technology); YAMAMOTO, Akiyasu (Tokyo University of Agriculture and Technology)

Presenter: QIN, Dongyi (Tokyo University of Agriculture and Technology)

Session Classification: THU-PO3-605 MgB2 and Iron-based Wires and Cables