ホットプレス法によって作製された Ba-122/Ag テープ線材の X 線マイクロ CT による内部構造観察

Microstructural Analysis in Hot-press Processed Ba-122/Ag Tape by X-ray Micro-CT

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(Ba, K)Fe_2As_2 (Ba-122) tape fabricated by power in tube (PIT) method is one of the most promising materials for practical applications because of high in-field J_c and irreversibility field. Furthermore, it is also reported Hot-press (HP) for PIT processed Ba-122 is effective for improvement of J_c. However, we have confirmed HP processed Ba-122 tape has J_c distribution by Scanning Hall-probe Microscopy (SHPM). In this study, we have carried out three-dimensional (3D) and non-destructive microstructural analysis of HP processed Ba-122 filament by using X-ray micro-CT.

Fig. 1 shows distribution of remanent magnetic field in HP processed Ba-122/Fe tape measured by SHPM. X-ray micro-CT observation was carried out between the voltage taps for transport measurement (shown by red square in Fig. 1). After the X-ray micro-CT observation with spatial resolution of 3.9 μm, we built 3D tomogram of Ba-122 tape. For the tomogram, brightness corresponds to the X-ray absorption ratio of the voxel. Fig. 2 (a) is full-range 3D tomogram for the confirmation of tape surface structure. Fig. 2(b) is 3D tomogram with increasing transparency threshold. If the composition of Ba-122 filament is homogeneous, X-ray absorption ratio would be the same and the shape of transparent region should be the same of Ba-122 filament. However, as shown in Fig. 2(b), difference of X-ray absorption ratio is confirmed. These regions are corresponding to low magnetic field regions measured by SHPM. This means high X-ray absorption compositions or materials such as Fe are cause of low J_c. In addition, higher X-ray absorption ratio as same as Ag sheathe and solder have been confirmed around the center of filament as shown in Fig. 2(c). These results indicate that X-ray micro-CT is useful and effective for 3D microstructural analysis for Ba-122 tape.

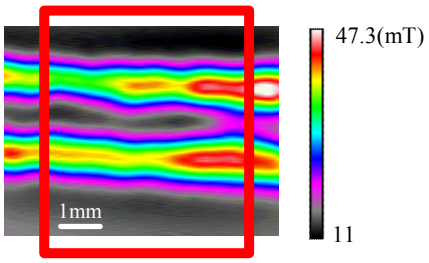

Fig. 1 Distribution of remanent magnetic field in Ba-122/Fe tape measured by Scanning Hall-probe Microscopy (SHPM). Red square corresponds to the area of X-ray micro-CT observation.

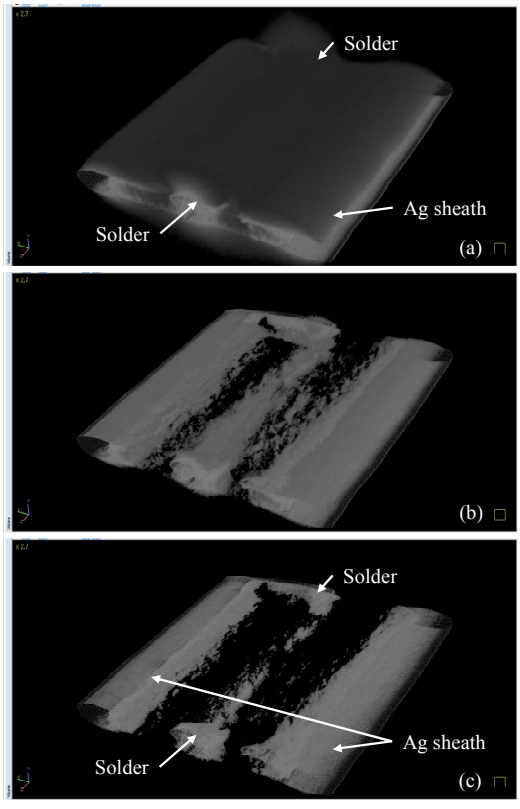

Fig. 2 Three-dimensional tomograms for HP processed Ba-122/Fe tape. (a) to (c) are corrensponding to increase of transparency threshold.

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