Strong Flux Pinning caused by Topographic Characteristics in (Ba, K)Fe$_2$As$_2$ Films

Myeong Jun Oh$^a$, Hyeong Jun Lim$^b$, M.S. Seo$^c$, S.Y. Park$^2$, Won Nam Kang$^d$ and Youn Jung Jo$^a$

$^a$Kyungpook National University, Daegu, Korea  $^b$Sungkyunkwan University, Suwon, Korea  $^c$Korea Basic Science Institute, Daejeon, Korea

We have reported that the strong flux pinning of (Ba, K)Fe$_2$As$_2$ thin films is induced by superconducting phase distribution characteristics. Depending on the growth conditions, our thin films have a diverse distribution which can induce various superconducting properties. The activation energy is one of the parameters that represent the pinning forces. We have compared the activation energy of two different distributions which have temperatures of 16780 K and 5900 K, respectively. The higher activation energy sample formed a mesh-textured distribution which had a delta-Tc pinning mechanism while the lower activation energy sample had an intrinsic pinning mechanism. Moreover, these distributions were achieved by EPMA elemental mapping which was modified by the overlay method. Therefore, we conclude that the superconducting phase distribution is strongly related to the flux pinning potential in the (Ba, K)Fe$_2$As$_2$ films.

Results & Discussions

Ex-situ Synthesis

- **Target**
Mixed powder (Ba99%, Fe99.99%, As99.99%) = 0.6:2:2.4 Sealed ampoule is annealed at 900 °C for 12 hours
Re-printed sample is annealed at 900 °C for 3 hours
- **Precursor film deposition with PLD**
Excimer LASER pulse(2000 times) on AO(0001) substrate
- **Potassiation intercalation**
Precursor film with potassium ramp in an annealed at 700 °C for 2 hours

Overlay process results of (a) plain and (b) textured film

Overlay process results of (a) plain and (b) textured film

Crystal structure

[Image 78x781 to 623x911]

Crystal structure

[Image 87x1298 to 621x1628]

Crystal structure

[Image 89x1085 to 539x1212]

Crystal structure

[Image 90x892]