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Critical current densities and superconducting properties for Fe $(Te_{1-x}Se_x)_{1-y}S_y$

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We have fabricated $Fe(Te_{1-x}Se_x)_{1-y}S_y$ high-quality bulk single crystals by the melting method with low heat treatment. First, three single crystals of x = 0.4, 0.45, and 0.46 were fabricated with the composition ratio of Fe $(Te_{1-x}Se_x)_{1-y}S_y$ as y = 0, and their superconducting properties were evaluated. Temperature dependence of magnetization showed that low-T_c region exists inside the crystals for x=0.4 and 0.45. The highest T_c of 14.4 K was obtained for x=0.45 crystal, and it decreased for x= 0.4 and 0.46. The highest J_c under the magnetic field parallel to the c-axis at 4.2 K was obtained for x=0.4 crystal, and achieved 0.15 and 0.05 MA / cm^2 at 0 T and 7 T respectively. At high temperature of 9 K, x=0.4 crystal had the highest J_c up to 3 T. To further improvement of superconducting properties we studied to fabricate single crystals in which the composition ratio of Fe $(Te_{0.6}Se_{0.4})_{1-y}S_y$ changes to y = 0.05, 0.1, 0.15 and 0.2.

Keywords: Single crystal, Fe (Te1-xSex) 1-ySy