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Synthesis and characterization of whisker crystals of iron-based superconductor[1] JUN LI, JIE YUAN, HUA-BING WANG, KAZUNARI YAMAURA, Superconducting Properties Unit, National Institute for Materials Science, Tsukuba, Japan — Single-crystal superconducting whiskers of $Ca_{10}(Pt_4As_8)(Fe_{1.8}Pt_{0.2}As_2)_5$ were grown in a Ta capsule in an evacuated quartz tube by a flux method [J. Li, *et al.* J. Am. Chem. Soc. 134, 4068−4071 (2012)]. This technique can be potentially useful for growth of other whiskers containing toxic elements, although the growth mechanism is not understood well. The $Ca_{10}(Pt_4As_8)(Fe_{1.8}Pt_{0.2}As_2)_5$ whiskers were confirmed to have excellent crystallinity with T_c of 33 K, $\mu_0 H_{c2}$ of 52.8 T, and J_c of 6.0×10^5 A/cm^2 (at 26 K). The T_c value is comparable with that of the bulk material. Since cuprate high-T_c superconducting whiskers are fragile ceramics, the present intermetallic superconducting whiskers with high-T_c have better opportunities for device applications. In addition, we studied the $Ca_{10}(Pt_4As_8)(Fe_{2-x}Pt_xAs_2)_5$ superconducting whiskers consisting of several grains. With current tunneling across the grain boundaries, current-voltage characteristics show the behavior of Josephson tunnel junction effect with pronounced hysteresis. In this talk, we review the growth of the superconducting whiskers and shows progress of studies of the Josephson junction using the whiskers.

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