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Origin of Superconductivity in the Y-Sr-Ru-O System EDUARD GALSTYAN, YUYI XUE, MILKO ILIEV, YANYI SUN, TcSUH, University of Houston, PAUL CHU, Hong Kong University of Science and Technology, TcSUH, Lawrence Berkeley National Laboratory — The origin of the superconductivity (SC) in the perovskite-based Sr_2YRuO_6 system with minor Cu doping on Ru ion sites has attracted much interest among researchers in recent years. Addressing the question of the nature of SC, J. D. Dow and D. R. Harshman proposed a model in which SC condensation occurs in the SrO plane. While the model appears to be in disagreement with many other research works, the exact reason of SC in the Y-Sr-Ru-O system is still uncertain. In this work we provide experimental evidence that the SC behavior of these materials is attributed to a minor impurity phase with the stoichiometry of $YSr_2Cu_3O_{7-\delta}$ (YSCO). We show that both the SC and the YSCO grains appear only when the synthesis temperature is higher than a local melting temperature. In addition, the YSCO grains, which are thermodynamically unstable under ambient pressure, appear within dense surroundings, where the melting indications are obvious. Stresses during solidification seem to play roles and may also explain the earlier reports of trace SC in YSCO samples synthesized at ambient pressure.

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