

Abstract Submitted  
for the MAR16 Meeting of  
The American Physical Society

**Crystal growth and intrinsic magnetic behavior of Sr<sub>2</sub>IrO<sub>4</sub>**  
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State Research — We report on the growth of stoichiometric Sr<sub>2</sub>IrO<sub>4</sub> single crystals, which allow us to unveil their intrinsic magnetic properties. The effect of different growth conditions has been investigated for crystals grown by the flux method. We find that the magnetic response depends very sensitively on the details of the growth conditions. We assess the defect concentration based on magnetization, X-ray diffraction, Raman scattering, and optical conductivity measurements. We find that samples with a low concentration of electronically active defects show much reduced in-gap spectral weight in the optical conductivity and a pronounced two-magnon peak in the Raman scattering spectrum. A prolonged exposure at high temperature during the growth leads to higher defect concentration likely due to creation of oxygen vacancies. We further demonstrate a systematic intergrowth of Sr<sub>2</sub>IrO<sub>4</sub> and Sr<sub>3</sub>Ir<sub>2</sub>O<sub>7</sub> phases by varying the growth temperature. Our results thus emphasize that revealing the intrinsic magnetic properties of Sr<sub>2</sub>IrO<sub>4</sub> and related materials requires a scrupulous control of the crystal growth process.

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Date submitted: 03 Nov 2015

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