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Reaction Kinetics of the Formation of $SmFeAsO_{1-x}F_x$ High T_c Superconductor Probed by High Energy X-ray Diffraction S. DAS, Y. SINGH, R. NATH, G.E. RUSTAN, A.I. GOLDMAN, J.Q. YAN, A. KREYSSIG, D.C. JOHNSTON, Ames Lab. and Dept. of Phys. and Astron., Iowa State Univ., Ames, Iowa 50011, R.W. MCCALLUM, M.J. KRAMER, Ames Lab. and Dept. of Mat. Sci. and Engg., Iowa State Univ., Ames, Iowa 50011 — The recent discoveries of superconductivity with T_c up to 55 K in a new class of compounds RFeAs$O_{1-x}F_x$ (R = rare earth), have attracted much attention. It is difficult to synthesize single phase high quality samples that are needed to study the intrinsic properties of these materials. The samples reported are made at high temperatures $T \sim 1100$ °C and usually contain impurity phases along with the RFeAs$O_{1-x}F_x$ phase. Information on the kinetics of formation of the superconducting phase would be helpful. Here we report the results of high-energy x-ray diffraction measurements versus temperature, carried out at the Advanced Photon Source. We determined the kinetics of the reaction between the appropriate mixtures of SmAs, Fe_2O_3, Fe, and SmF_3 to give nominal compositions of SmFeAsO and $SmFeAsO_{1-x}F_x$, respectively. Our results indicate that the $SmFeAsO_{1-x}F_x$ phase starts forming at $T \sim 750$ °C and its formation ceases by ~ 1000 °C. *Supported by the USDOE under Contract Nos. DE- AC02-07CH11358 and DE-AC02-06CH11357.

Supriyo Das
Ames Laboratory and Department of Physics and Astronomy,
Iowa State University, Ames, Iowa 50011

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