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**Study on possible correlation of superconductivity with defects and superparamagnetism in undoped $AFe_2As_2$ with A=Ca, Sr and Ba** KUI ZHAO, Texas Center for Superconductivity and Department of Physics, University of Houston, BING LV, Texas Center for Superconductivity, University of Houston, LIANGZI DENG, Texas Center for Superconductivity and Department of Physics, University of Houston, YUYI XUE, Texas Center for Superconductivity, University of Houston, PAUL CHU, Texas Center for Superconductivity and Department of Physics, University of Houston; Lawrence Berkeley National Laboratory, 1 Cyclotron Road, Berkeley, HIGH PRESSURE LOW TEMPERATURE LAB TEAM — Extensive studies have been carried out on the induction of bulk superconductivity in the Fe-pnictide 122 system with a $T_c$ up to 38 K through doping and/or pressure. However, non-bulk superconductivity has also been detected unexpectedly in undoped $AFe_2As_2$ where A = Ca, Sr, and Ba with $T_c$ = ∼12K, ∼22K and ∼23K, respectively. The reason for the observation remains unknown. Recently, systematic investigation shows that highly anisotropic superconductivity with a $T_c$ up to 49 K and superparamagnetism occur in rare-earth doped Ca122. Further examination reveals slight deviation from the 1:2:2 stoichiometry which correlates closely with the occurrence of non-bulk superconductivity and superparamagnetism in these samples. We have therefore decided to investigate systematically the stoichiometry, defects, magnetism and superconductivity in undoped $AFe_2As_2$ single crystals under different synthesis conditions where A = Ca, Sr, and Ba. Results will be presented and discussed.

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