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Mapping the Superconducting Anti-ferromagnetic C_4 Phase in Iron-Pnictides[1] RYAN STADEL, KEITH TADDEI, Physics-Northern Illinois University and MSD-Argonne National Lab, DAN BUGARIS, SAUL LAPIDUS, HELMUT CLAUS, DANIEL PHELAN, MSD-Argonne National Lab, DUCK YOUNG CHUNG, MERCOURI KANATZIDIS, MSD-Argonne National Lab and Chemistry-Northwestern University, RAYMOND OSBORN, STEPHAN ROSENKRANZ, MSD-Argonne National Lab, OMAR CHMAISSEM, NIU and ANL — Following the discovery of the microscopic coexistence of antifermagnetic spin density waves and superconductivity in $Ba_{1-x}K_xFe_2As_2$ and the low temperature re-entrance to the novel magnetic C_4 tetragonal phase in $Ba_{1-x}Na_xFe_2As_2$, there has been significant interest in developing an understanding of the properties and formation of these phases and analyzing their dependence on temperature and composition in hole-doped 122 alkaline earth metal/iron-pnictides. We describe the mapping of various Ba, Sr, and Ca 122 phase diagrams with systematically controlled levels of hole-doping of alkaline metal onto the alkaline earth metal site, which was investigated via x-ray and neutron diffraction. Our elaborate synthesis, diffraction work, and analysis maps and firmly establishes the C_4 phase space in these ternary diagrams as well as the boundary lines that separate the individual phases, and provides natural clues as well as a framework to investigate the stability and formation of the C_4 domes that shift location with doping contents in the phase diagrams.

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