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Evolution of superconductivity in $Ca_{1-x}La_xFe_2As_2$ under pressure[1]

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The evolution of superconductivity in single crystals of the aliovalent La-doped $CaFe_2As_2$ is studied with both quasi-hydrostatic and hydrostatic applied pressures measuring transport, magnetic, and neutron scattering properties. The application of pressure to under doped samples of $Ca_{1-x}La_xFe_2As_2$ suppresses the antiferromagnetic (AFM) transition and causes an abrupt appearance of superconductivity with T_c values similar to those (about 45 K) recently been reported at ambient pressure. This superconducting phase appears under both quasi-hydrostatic and hydrostatic pressures, indicating an intrinsic property of the observed superconducting state. Unlike transition metal-doped 122 iron-superconductors where superconductivity happily coexists with AFM, the little coexistence of SC and AFM appears to mimic that found in 1111 iron-superconductors, suggesting a similar phase diagram. The unusual dichotomy between lower-T_c systems that happily coexist with AFM and tendency for the highest-T_c systems to show phase separation provides an important clue to the pairing mechanism in iron-based superconductors.

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