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Muon Spin Relaxation Studies of RFeAsO and MFe_2As_2 Based Compounds[1]

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Muon spin relaxation measurements of a variety of iron pnictide systems have revealed commensurate long range magnetic order in the parent compounds which can change to incommensurate order with carrier doping. Magnetic order gives way to superconductivity with increased doping; however there are regions of the phase diagrams where the two phenomena co-exist. In the case of $Ba_{1-x}K_xFe_2As_2$ there is phase separation into superconducting and magnetic domains, whereas in $Ba(Fe_{1-x}Co_x)_2As_2$ the coexistence is apparently microscopic for $x = 0.035 \rightarrow 0.048$. Transverse field muon spin rotation measurements of single crystal $Ba(Fe_{1-x}Co_x)_2$ and $Sr(Fe_{1-x}Co_x)_2$ exhibit an Abrikosov vortex lattice from which we are able to determine the magnetic field penetration depth and Ginzburg-Landau parameter. The temperature variation of the superfluid density is well described by a two-gap model. In $Ba(Fe_{1-x}Co_x)_2As_2$, both the superconducting T_C and the superfluid density decrease with increasing doping above $x = 0.06$; in all of the pnictides we find that the superfluid density obeys the same nearly linear scaling with T_C as found in the cuprates.

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