NMR study of superconductivity and magnetism in pnictides

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A strinking unexpected feature of the phase diagram of materials where unconventional superconductivity has been evidenced is the existence of a long range magnetic order adjacent to the superconductivity. Deciding if superconductivity and magnetism exclude each other or may coexist has been subject of intense debate, revived recently by the discovery of pnictides. We present NMR results on electron doped Ba(FexCo1-x)2As2 single crystals which demonstrates that for x=0.06, the sample experiences both full volume superconductivity (Tc=21K) and incommensurate spin density wave order (Tsdw=31K) on the same Fe sites, the magnetic order being unaffected by superconductivity. Our static and dynamic 75As NMR measurements allow us to rule out for the first time any possible phase segregation, even if it was to be nanometer sized. This is a strong support toward s+- superconductivity symmetry in these systems, as suggested by many theoretical reports. We also address the issue of the impact of the Co doping by its substitution directly inside the FeAs layer and show that it does lead to a remarkable electronic homogeneity in contrast with cuprates and other correlated materials.We will also present new results recently obtained in other pnictide families with various distances between Fe layers.

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[2] The European Physical Journal B, vol 73, num 2, 161-166 (2010)