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Spatial competition of the ground states in 1111 iron pnictides GUILLAUME LANG, ESPCI, PSL; CNRS; UPMC; LPEM, Paris, France, LOUIS VEYRAT, UWE GRÄFE, FRANZISKA HAMMERATH, IFW, IFF, Dresden, Germany, DALIBOR PAAR, Dept. of Physics, Univ. of Zagreb, Zagreb, Croatia, GÜNTHER BEHR, SABINE WURMEHL, HANS-JOACHIM GRAFE, IFW, IFF, Dresden, Germany — Using nuclear quadrupole resonance, the phase diagram of 1111 pnictides is constructed as a function of the local charge distribution in the paramagnetic state, which features low-doping-like (LD-like) and high-doping-like (HD-like) regions. Comparison of compounds based on magnetic (Ce, Sm) and nonmagnetic (La) rare earths reveals the detrimental role of static iron $3d$ magnetism on superconductivity (SC). It is found that the LD-like regions fully account for the orthorhombicity of the system, and are thus the origin of any static iron magnetism. Orthorhombicity and static magnetism are not hindered by SC but limited by dilution effects, in agreement with 2D (respectively 3D) nearest-neighbor square lattice site percolation when the rare earth is nonmagnetic (respectively magnetic). The LD-like regions are not intrinsically supportive of SC, contrary to the HD-like regions, as evidenced by the Uemura relation between T_c and the superfluid density when accounting for the proximity effect. We propose[1] a complete description of the interplay of ground states in 1111 pnictides, where nanoscopic regions compete to establish the ground state through suppression of SC by static magnetism, and extension of SC by proximity effect.

[1]G. Lang et al., PRB 94, 014514 (2016)

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