

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Competing Impurities in an Antiferromagnetic Background.

LYUDMYLA ADAMSKA, Goteborg University, MARCELLO B. SILVA NETO, Stuttgart University, CRISTIANE MORAIS SMITH, Utrecht University — We study the order-from-disorder transition and reentrant magnetism in a doped crystal $\text{La}_{2-x}\text{Sr}_x\text{Cu}_{1-z}\text{Zn}_z\text{O}_4$ within the framework of a long-wavelength nonlinear sigma model that properly incorporates the Dzyaloshinskii-Moriya and XY anisotropies. The effect of doping La_2CuO_4 with nonmagnetic impurities, such as Zn, is considered according to classical percolation theory, while the effect of the Sr-doped charge carriers is described as a dipolar frustration of the antiferromagnetic order. We derive the expressions for several magnetic, thermodynamic, and spectral properties of the system, such as the Néel temperature, the spin-stiffness, and the anisotropy gaps, as well as their evolution with both Zn and Sr doping for cases of ballistic and diffusive vacancies. We solve the problem analytically in the limits of low and high temperatures. The connection to several experiments will be discussed [Phys. Rev. B59, R725 (1999), Science 295, 1691 (2002), Phys. Rev. Lett. 93, 027001 (2004)].

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Date submitted: 20 Nov 2006

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