DE LA RECHERCHE À L'INDUSTRIE

Séminaire

Vendredi 17 Mai 2019 à 14h

Salle de réunion du SRMP – Bâtiment 520 - Pièce 109

Magnetic defects as studied by neutron scattering

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Neutrons are an invaluable probe to study magnetic defects in bulk materials. I will give a few examples of neutron experiments investigating local defects or larger-scale ones in several ferromagnetic-like media, either metallic or insulating.

In $Fe_{1-x}Cr_x$ alloys, Cr atoms repel each other as near neighbors at low concentration (below x_c=0.11), while they attract each other above x_c [1]. This unique case in nature yields a subtle interplay between magnetic and chemical short range orders [2]. In dilute alloys, the moments locally cant around Cr impurities, a precursor effect of the frustrated reentrant spin glass phases observed at higher Cr content.

In similar reentrant spin glasses, vortex like-texture can be observed by small angle neutron scattering, as shown in $Ni_{0.79}Mn_{0.21}$ single crystal [3]. Monte-Carlo simulations allow us to identify their differences with the frustrated skyrmions predicted in ordered chiral magnets.

Static displacements due to lattice defects are well known in irradiated materials. We recently discovered that they also exist in the frustrated pyrochlore $Pr_2Zr_2O_7$, induced by Pr/Zr site inversion. The local strains promote a new state of matter described as a quantum spin liquid. It is characterized by short range antiferromagnetic correlations between quadrupolar moments, and a peculiar dynamics preserving spin fluctuations down to T=0 [4].

[1] I. Mirebeau, M. Hennion, G. Parette *Short range order inversion in a transition alloy* Phys. Rev. Lett **53**, 687(1984); Phys; Rev. B **82**, 104203 (2010)

[2] I. Mirebeau, V. Pierron-Bohnes, C. Decorse, E. Rivière, Chu-Chun Fu, Kangming Li, G. Parette, Magnetic and atomic short range order in $Fe_{1-x}Cr_x$ alloys, submitted (2019).

[3] I. Mirebeau, N. Martin et al Spin textures induced by quenched disorder in a reentrant spin glass: vortices versus frustrated skyrmions, Phys; Rev. B **98**, 014420 (2018)

[4] N. Martin et al Disorder and quantum spin ice, Physical Review X **7**, 041208(2017).

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