| | | |
|---|---|---|
| ESRF | **Experiment title:**<br>Symmetry lowering in the two-dimensional triangular lattice antiferromagnet $CuMnO_2$ | **Experiment number**:<br>**HE-3237** |
| **Beamline**: | **Date of experiment**:<br>from: 17/09/ 2009 to: 19/09/2009 | **Date of report**:<br>30 July 2014 |
| **Shifts:** | **Local contact(s)**:<br>Dr Irene Margiolaki | *Received at ESRF:* |

**Names and affiliations of applicants** (* indicates experimentalists):

*Alexandros LAPPAS; IESL, Foundation for Research & Technology - Hellas, Greece
*Othon ADAMOPOULOS; IESL, Foundation for Research & Technology - Hellas, Greece
*Carlo VECCHINI; ISIS-Facility, RAL-STFC, UK
*Maria POIENAR; Laboratoire CRISMAT, CNRS UMR 6508, France

**Report:**

The ID31 T-dependent diffraction experiments carried within this proposal have been partially published and details can be found in the following citation:

"Substitution Effect on the Interplane Coupling in Crednerite: the $Cu_{1.04}Mn_{0.96}O_2$ Case"
M. Poienar et al
*Chem. Mater*. **2011**, *23*, 85–94
DOI:10.1021/cm102483m

The abstract of the publication is also appended below.

CHEMISTRY OF MATERIALS
Article

*Chem. Mater.* **2011,** *23,* 85–94 85
DOI:10.1021/cm102483m

# Substitution Effect on the Interplane Coupling in Crednerite: the $Cu_{1.04}Mn_{0.96}O_2$ Case

M. Poienar,*,† C. Vecchini,‡,§ G. André,∥ A. Daoud-Aladine,‡ I. Margiolaki,⊥ A. Maignan,† A. Lappas,§ L. Chapon,‡ M. Hervieu,† F. Damay,∥ and C. Martin†

†*Laboratoire CRISMAT, CNRS UMR 6508, 6 Bd Ml Juin, 14050 CAEN CEDEX, France,* ‡*ISIS Facility, Rutherford Appleton Laboratory-STFC, Chilton, Didcot, Oxfordshire OX11 0QX, United Kingdom,* §*Institute of Electronic Structure and Laser, Foundation for Research and Technology−Hellas, Vassilika Vouton, 711 10 Heraklion, Crete, Greece,* ∥*Laboratoire Léon Brillouin, CEA-CNRS UMR 12, 91191 GIF-SUR-YVETTE CEDEX, France, and* ⊥*ESRF- Polygone Scientifique Louis Néel -6, rue Jules Horowitz, 38000 Grenoble, France*

*Received August 30, 2010. Revised Manuscript Received November 19, 2010*

The 4%Cu for Mn substitution in $CuMnO_2$ decreases slightly the lattice parameters, reduces the Jahn−Teller distortion of the $MnO_6$ octahedra, but does not change the temperature dependence of the structure, showing a *C*2/*m* to $P\bar{1}$ structural transition (in the vicinity of the magnetic transition temperature). In contrast, the antiferromagnetic structure is strongly modified by the substitution, as a propagation vector $\mathbf{k} = (0\ ^1/_2\ 0)$ is evidenced for $Cu_{1.04}Mn_{0.96}O_2$ compared to $\mathbf{k} = (0\ ^1/_2\ ^1/_2)$ for $CuMnO_2$. Consequently, the interplane magnetic coupling (along the *c* axis) changes from antiferromagnetic in $CuMnO_2$ to ferromagnetic in $Cu_{1.04}Mn_{0.96}O_2$ without change in the antiferromagnetic arrangement of the ferromagnetic chains in the (*a*,*b*) plane. The nanostructural study points toward the existence of numerous defects at the nanoscale which justify the modeling of strains used in the refinement of the crystalline structure.