MS38-P9 Adsorption of PVP polymer onto hydroxyapatite using a co-precipitation technique

Mongi Debbabi[1], Hassen Agougui[1]

1. Laboratoire de Physico-chimie des Matériaux, Université de Monastir, Faculté des Sciences, 5019 Monastir, Tunisia.

email: m.debbabi@yahoo.fr

The hybrids compounds hydroxyapatite-polymer has interesting applications in biomedical domain, such as artificial bones and dental implants. In this scope, calcium hydroxyapatite was prepared in the presence of polyvinylpyrrolidone (PVP), at room temperature for 72 h. The synthesized samples were characterized by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), chemical analysis, atomic force microscopy (AFM) and scanning electron microscope (SEM). The X-ray powder analysis showed that the cristallinity is sensibly affected by the presence of polymer. IR spectra display the vibration modes of PO_4^{3-} and new vibration modes related to PVP, essentially at 2930, 1315, 945, 764 and 514 cm^{-1} . In addition, the conservation of (P-OH) band, suggested the formation of organic-inorganic bond between the PVP and Ca^{2+} ions of apatite. Atomic Force Microscopy (AFM) showed that the texture surface was changed by grafting.

Keywords: Hydroxyapatite, PVP, SEM, AFM.

MS38-P10 Local atomic and magnetic structure of 1D spin-chains in multiferroic copper guanidinium formate

Anthony E. Phillips[1], Alan J. Drew[1]

1. Queen Mary University of London

email: a.e.phillips@qmul.ac.uk

The metal-organic framework copper guanidinium formate, $C(NH_2)_3[Cu(HCO_2)_3]$, is of interest for its multiferroic properties, recently shown to include hybrid improper ferroelectricity and substantial magnetoelectric coupling [1]. This material's structure is analogous to the well-known inorganic perovskite $KCuF_3$, with guanidinium ions in the pores of a pseudo-cubic copper-formate framework. As in the inorganic counterpart, cooperative Jahn-Teller distortion results in one-dimensional antiferromagnetic Heisenberg spin chains containing short Cu coordination lengths. These chains interact only weakly with one another through longer bonds, and hence 3D magnetic order freezes in only at very low temperatures.

The Jahn-Teller distortion in this material does not directly cause ferroelectric ordering but is coupled to it *via* hydrogen bonding between the framework and guest ions. In order to determine the origins of this material's multiferroicity, it is therefore important to understand the origin of the cooperative distortion. Even in the well-studied inorganic analogue $KCuF_3$, however, this remains obscure, with recent studies suggesting that the true behaviour of that system involves fluctuations about a lower-symmetry structure [2]. Modelling the behaviour of the title framework, which may involve coupling between lattice, orbital, and spin degrees of freedom, thus requires an understanding of fluctuations in both the atomic and magnetic structures in both space and time. To this end we here complement neutron crystallographic studies of this material with muon spin resonance and inelastic neutron scattering measurements on mosaic samples.

The muon sites in this material are close to the formate oxygen atoms and, given the Jahn-Teller distortion of the CuO_6 octahedra, are therefore located at a range of convenient distances from the Cu to measure its local magnetic field. We report studies under transverse and longitudinal magnetic fields, yielding information about the short-range correlations in the 1D chains and critical exponents for the magnetic phase transition. Inelastic neutron scattering measurements reveal the magnetic excitation spectrum of the 1D and 3D regions, including the spinon continuum and longitudinal mode. Our results provide direct experimental confirmation of the local magnetic structure of this material.

[1] Y. Tian *et al.* (2015) Physica Status Solidi RRL **9**, *1*, 62

[2] J. Deisenhofer *et al.* (2011) Ann. Phys. **523**, *8*, 645

Keywords: metal-organic framework, 1D magnetism, μSR, inelastic neutron scattering, Jahn-Teller distortion, multiferroic