s8.m27.p4 ***In situ* time resolved study of fast chemical reactions using X-ray powder data.** H.K.R. Dunn, G.B.M. Vaughan, A. Kvick, *E.S.R.F, 6 rue Jules Horowitz, BP 220, 38043 Grenoble cedex 9, France. E-mail: hdunn@esrf.fr*

Keywords: Powder diffraction; Spinel structure; Rietveld refinement

Spinel ferrites, such as $MnFe_2O_4$, are used in fields such as electronics. However, the synthesis of these compounds is often complex, requiring several time and energy consuming steps. Self-propagating High-temperature Synthesis (S.H.S.) is a rapid, single step, energy-efficient technique which may be used to produce compounds such as spinel ferrites. The time scale of such reactions is the order of seconds. As the purity and microstructure of the final products is a function of the reaction path, we have undertaken a study to determine the reaction mechanisms of such reactions. Ferrites were synthesized from simple metal oxides, metals, and perchlorates, packed into pellets (1g, Ø 13mm). S.H.S. reactions were then initiated in situ using a mechanical ignition system. Time resolved 2-D powder diffraction data were collected on an ESRF Frelon CDD detector (1024x1024 pixels with a time resolution of 60ms) using an energy of 50 keV. The diffraction patterns were obtained in transmission mode, in order to collect bulk information on the reaction mechanism. A total number of 260 frames were recorded as the reaction front passed the probing X-ray beam, giving information on the preheated, reaction and cooling regions. After treatment and integration of the images, the data were analyzed by Rietveld refinement in G.S.A.S. Insight into the reaction mechanisms were obtained from the microstructure and quantitative phase fractions . Using the insights thus gained, the reactions were further tuned to obtain the desired results.

s8.m27.p5 **Magnetic Properties of $Pr_{1-x}Gd_xMn_2Ge_2$.** Y. Elerman, A. Elmali, I. Dincer, *Ankara University, Faculty of Engineering, Department of Engineering Physics, 06100 Besevler-Ankara, Turkey. E-mail: elerman@ankara.edu.tr*

Keywords: Rare-earth compounds; Transition metal compounds; Layered magnetic structures

The magnetic couplings in the RMn_2X_2 compounds with R a rare-earth and X Ge or Si within and between the Mn layers is closely related to the *in-plane* Mn-Mn spacing. d^{a}_{Mn-Mn} One can vary the value in the neighbourhood of the critical value by alloying different elements to RMn_2Ge_2 with R heavy rare-earth and observe the destruction, stabilization, and variation of different types of ferromagnetic and antiferromagnetic phases. In this paper, we have studied magnetic properties of $PrMn_2Ge_2$ compounds by substituting Gd for light rare-earth Pr. This leads to the transition from parallel to antiparallel spin alignment in adjacent Mn layers. In such a study, it is possible to gain information on both *intra*layer and *inter*layer magnetic properties of Mn planes [1-3].

The structural and magnetic properties of $Pr_{1-x}Gd_xMn_2Ge_2$ were studied by X-ray diffraction and magnetization measurements. The substitution of Gd for Pr leads to a linear decrease in the lattice constants, and the magnetic interactions in the Mn sublattice cross over from a ferromagnetic character to an antiferromagnetic one. At low temperatures, the rare-earth sublattice also orders and reconfigures the ordering in the Mn sublattice. The spins in the Mn sublattice are arranged parallel to the Pr sublattice and antiparallel to the Gd sublattice. The results are collected in a phase diagram [4].

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