

**PS08.02.09 DISSYMMETRIZATION AND POLYMORPHISM IN THE APATITE GROUP MINERALS.** R.K. Rastsvetaeva, Inst. of Crystallography RAS, Leninskii pr.59, Moscow, 117333; A.P. Khomyakov, Inst. Miner. Rare Elem., Veresaev str.15 Moscow, 121357

Due to extremely high ability to isomorphism, apatites can be used as natural absorbents of polluting components to solve some ecological problems. That's why studying of apatite group minerals is very actual. New minerals Deloneite-(Ce)  $\text{NaCa}_3\text{Ce}(\text{PO}_4)_3\text{F}$  and ordered apatite  $\text{Ca}_3\text{R}_{1.8}(\text{PO}_4)_3\text{F}$  (R=Sr,Na,Ce) occur in the hyperagpaitic pegmatites of the Khibina alkaline massif (Kola Peninsula). Parameters of both minerals cell:  $a=9.51(1)$ ,  $c=7.01(1)\text{\AA}$ , space group P3;  $a=9.485(3)$ ,  $c=7.000(3)\text{\AA}$ , space group P63. X-ray single crystal analysis was performed on CAD-4F ENRAF-NONIUS autodiffractometer, 735 and 637 IFI,  $R=4.9\%$  and  $2.9\%$  respectively. In spite of the fact that deloneite is isotypical to belovite  $\text{NaSr}_3\text{Ce}(\text{PO}_4)_3\text{F}$  (space group P-3) these two minerals differ not only in the stoichiometry, but also in their crystal structures and other characteristics. Also new apatite has special peculiarities in comparison with fluoroapatite  $\text{Ca}_5(\text{PO}_4)_3\text{F}$  and Sr-apatite  $(\text{Sr,Ca})_5(\text{PO}_4)_3\text{F}$ . The series of apatite-like minerals  $\text{A}_5(\text{PO}_4)_3\text{X}$  (A=Na, Ca, Sr, TR; X=F, Cl, OH): apatite - new R-apatite - belovite - deloneite is characterized by the lowering of symmetry P63/m - P63 - P-3 - P3 due to the cationic and additional anionic ordering in their structures. This fact allowed us to consider the possible reasons of this phenomena and suggest a new nomenclature using 6 end-members for the describing and comparing chemical distinctions of these complicated phosphates.

**PS08.02.10 HIGH-TEMPERATURE M-SITE DISORDERING IN Mn-OLIVINES BY IN-SITU NEUTRON DIFFRACTION.** Simon A.T. Redfern<sup>2</sup>, C.M.B. Henderson<sup>1</sup>, K.S. Knight<sup>3</sup>, B.J. Wood<sup>4</sup>.

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The nonconvergent order/disorder behavior over M1 and M2 sites has been determined as a function of temperature for 50:50 (Mg:Mn) and (Fe:Mn) olivines between 293 and 1273 K. Rietveld structure refinements of the high-temperature neutron diffraction data reveal that the amount of Mn in M2 increases (approaching its equilibrium value) on increasing temperature to around 770 K, and then decreases along its equilibrium path towards 50%. These data are interpreted within a Landau model for non-convergent order/disorder in olivine. We find that M-site order/disorder is non-quenchable and only observable by high-temperature in-situ study. The room temperature site occupancy can be used as a geospeedometer, since it depends only on the cooling rate of the crystal and is related to the temperature at which the M1:M2 occupancies depart from equilibrium on cooling. The activation energy for Fe:Mn exchange is calculated as some 193 kJ/mol. The results are used to infer cooling rates of natural and synthetic Mn-olivines using data culled from the literature, where previous structural studies list room-temperature M-site occupancies.

**PS08.02.11 ORGANOMINERAL COMPLEXES IN LACUSTRINE SOILS FROM XOCHIMILCO (MEXICO).** Amada Laura Reyes Ortigoza<sup>1</sup>, Nicolas Aguilera Herrera<sup>1</sup>, Norma García Calderón<sup>1</sup>, Jaqueline Cañetas Ortega<sup>2</sup>, <sup>1</sup>Facultad de Ciencias, <sup>2</sup>Instituto de Física, Universidad Nacional Autónoma de México

**Introduction.** The most important organominerals (OM) in soils have a union between simple or complex minerals (clays) and organic material as humic acids (HA), fulvic acids (FA). The stability of OM complexes and its resistance to degradation give a wide utility in vegetal nutrition. These complexes establish the modern organic agriculture in high productivity groups.(1). This investigation in order to characterise some OM crystals in soils.

**Materials and Methods.** Three soil samples from lacustrine sites Xochimilco with different pHs (acid, neutral and alkaline) were separated in particle sizes in order to investigate the clay fraction (with and without organic matter) and the organic fractions HA, FA. All samples were characterised with X ray diffraction (XRD), infrared spectroscopy (IR), microsonde, atomic plasma spectrochemical analysis, transmission electron microscopy (TEM), and scanning electron microscopy (SEM).

**Results and Discussion.** Clay-OM complexes (with and without organic matter), HA and FA originated of samples from the soils pH alkaline and acid showed differences defined by IR spectra, TEM, SEM and the total metal contents. The OM did not show any difference in pHs acid and neutral. The values d/N of XRD, TEM, SEM and IR indicated presence for the following crystalline minerals feldspars, quartz, micas, pyroxenes, smectites, halloysite, amphiboles, allophane and cristobalite.

**References:**

1.Newman,A.C. 1987. Chemistry of clays and clays minerals, Longman Scientific & Technical. Mineralogical Society. Monograph No. 6 480 pp.

**PS08.02.12 ON THE SYMMETRY OF SYNTHETIC AND BIOLOGICAL HYDROXYAPATITE.** J. Reyes-Gasga, M. Benaissa, D. Romeu, Instituto de Física, UNAM Apartado Postal 20-364, 01000 Mexico D. F., Mexico

Hydroxyapatite is an important calcium phosphate in biomaterials science since it is the principal constituent of tooth bones and cements. In this work we have made use of electron microscopy, electron diffraction, and image simulation to study both synthetic and biological hydroxyapatite. We have observed the systematic appearance of crystallographic forbidden spots in their electron diffraction patterns. Structural disorder, double diffraction, super and/or modulated structures and size effects are discussed as possible causes. Since we have found no samples in which they were absent, we believe their presence must be an inherent feature on the structure of hydroxyapatite.

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