the $M(1)$ site of $Na_2(Mn_{0.75}Ca_{0.25})Fe^{2+}Fe^{3+}(PO_4)_3$ and Mg in the $M(1)$ and $M(2)$ sites of $Na_2(Mn_{0.25}Mg_{0.75})Fe^{2+}Fe^{3+}(PO_4)_3$. The partially disordered distribution of Cd and Na between the $A(1)$ and $M(1)$ sites results from the similar ionic radii of $Cd^{2+}$ (0.95 Å) and $Na^+$ (1.02 Å) [7]. The Rietveld refinements of the $Na_2(Mn_{1-x}Mg_x)Fe^{2+}Fe^{3+}(PO_4)_3$ alluaudite-type compounds are still in progress.

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## MS11 P04

**Full structural study of the zeolitic zincophosphate $[H_3N(CH_2)_3NH_3]_{0.4}[H_{0.2}ZnPO_4]$**

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**Keywords: zincophosphates, hydrothermal synthesis, organic template**

The large number of open-framework metal phosphates which have been recently synthesized and studied is a consequence of their potential applications in the areas of catalysis, sorption and separation processes. The zinc phosphates constitute one of the largest families of open-framework materials that have been studied during the past few years. This is mainly due to their similarity with the zeolites: the total charge of the divalent zinc phosphates is the same as the aluminosilicate zeolites. In fact, several zinc phosphates possess zeolitic structures. Hydrothermal methods have been extensively used in the synthesis of this kind of compounds, employing organic amines as templates which act as structure-directing or space-filling agents. In many cases, the location and definite identification of those extra-framework organic species is problematical; their high degree of disorder makes impossible to study the role of N--H···O bonds in establishing or stabilizing the structure. We report here the hydrothermal synthesis and full structural determination of an organically templated zincophosphate $[H_3N(CH_2)_3NH_3][H_{0.2}ZnPO_4]$. The structure of this compound, which has the same tetrahedral connectivity than that in the zeolite edingtonite family, was reported by Harrison *et al.* six years ago. Nevertheless, the position of the organic template could then not be determined. In this work a complete study of the framework-template interactions is analyzed.

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## MS11 P05

**Investigation of the micro/nanostructure and the structure defect of sedimentary phosphates by electron microscopy**

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**Keywords: Phosphates, Microstructure, structure defect**

The Moroccan sedimentary phosphates are essentially constituted by apatite, mineral which finds application in all domains; like medicine, nuclear wastes, biology and geology. These phosphates contain some ppm of uranium undergoes spontaneous fission since its geological formation. This spontaneous fission causes the (irradiation) defects in the structure, by recoil of the fission products.
This work focuses on the exam of the micro/nanostructure, the local structure and the irradiated defect in the structure of several grains of phosphate by electron microscopy observations. Several STEM imaging and X cartographies are obtained, the Scanning Electron Microscope (SEM) shows the internal morphology of the grains and its qualitative analysis, where as, the Transmission Electron Microscope (TEM) gives the quantitative analysis and the structure of the material studied here. This electronic microscopy offers the possibility to observe the sample during its analysis; it was possible to put in evidence the heterogeneities in the grains and to characterize all the precipitate zones seeming to be homogeneous.
On the other hand, the SEM was also served to study the irradiation defects especially the fission tracks and to exam the effect of heat treatment at various temperature between 100 and 900°C, on the structure and the micro/nanostructure of apatite.
The results of this study are summarized as follows:

1- The phosphate grains show various concentric zones: clear and dark one
2- All the grains studied here are the composition and the crystalline structure of apatite
3- The crystallite size is about
4- The grains present a micro and nanoporosity.
5- The irradiation damage, especially the fission track, is clearly observed by SEM, but confusion can take place since the fission track and the nanoporosity are the same form and size.
6- The optical microscope is used for identification of the fission tracks and the counting of their density
7- The heat treatment of apatite grains at various temperature (between 100 and 900°C) for about 2 hours leads to an improvement of the apatite crystalline structure and to the disappearance of irradiation damage (fission tracks) , especially at 600°C.
8- The X ray diffraction analyses confirm some of these results, especially these concerning the structure and the crystallite sizes.

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