

**MS14-P8** Seed-mediated synthesis of nanosized crystals of Beta zeoliteBorislav Z. Barbov<sup>1</sup>, Yuri A. Kalvachev<sup>1</sup>

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The high industrial interest to zeolite Beta originates from the broad Si/Al range in zeolite Beta ( $5 - \infty$ ) and its particular structure, being an intergrowth of different polymorphs and therefore being disordered in one dimension. The combination of three-dimensional pore architecture composed of intersecting 12-ring channels with strong acid sites makes this zeolite useful catalyst in a number of processes - such as catalytic cracking, hydroisomerisation, alkylation of aromatics, and esterification reactions, *etc.* In order to obtain nanosized crystals of zeolite Beta hydrothermal seed-induced synthesis is performed. Nanosized zeolites are important in catalytic and adsorptive applications. Smaller crystals of zeolites have larger surface areas and less diffusion limitations compared to zeolites with micrometer-sized crystals. During the synthesis two types of seeds are used - crystal seeds and mother liquor. Seed-induced synthesis by using of mother liquor as seeds leads to high yield of zeolite crystals. Crystal growth kinetics of the material as a function of seed content, type of seeds and Si/Al ratio of the initial gel are studied. After the optimization of crystallization conditions a highly crystalline material with crystal size 100–200 nm is synthesized. The obtained crystals were characterized by X-ray diffraction, scanning electron microscope, thermogravimetric analysis, and infrared spectroscopy.

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**Keywords:** Nanozeolites, Zeolite Beta, Seed-assisted synthesis

**MS14-P9** RbMnPO<sub>4</sub> Zeolite-ABW-Type Material: a new multiferroic mineral related materialS. Prugovecki<sup>1</sup>, G. Nénert<sup>1</sup>, L. Lin<sup>2</sup>, R. Kremer<sup>3</sup>, H. Ben Yahia<sup>4</sup>, C. Ritter<sup>5</sup>, E. Gaudin<sup>4</sup>, O. Isnard<sup>6</sup>

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The relation between crystal structure and properties of minerals and mineral-related materials is the key for technological benefit. A revival of the investigation of minerals related materials by the physicists and chemists took place in the recent years due to raising interest in multiferroic and magnetoelectric materials. Magnetoelectric materials are particularly of interest as one can control their magnetic properties by the application of an electric field and vice-versa. On the other hand, minerals have been a large source of materials for magnetoelectric compounds. Families like triphylite (LiMPO<sub>4</sub>, M = Co, Fe, Ni) [1], boracites (M<sub>3</sub>B<sub>7</sub>O<sub>13</sub>X, M = transition metal ion, Mg, Cd; X = halogen, OH, F or NO<sub>3</sub>) [2] or pyroxenes AMX<sub>2</sub>O<sub>6</sub> (A = Li, Na, Ca; M = transition metal ion; X = Si, Ge) have been widely investigated due to their magnetoelectric and multiferroic properties [3]. Here, we report on the magnetic and dielectric properties of a zeolite-ABW-type material, namely RbMnPO<sub>4</sub> [4,5]. This material exhibits a complex and rich phase diagram as function of temperature as illustrated in Figure 1. This system exhibits 5 different phases as function of temperature (T<sub>1</sub> = 4.7 K, T<sub>2</sub> = 5.1 K, T<sub>3</sub> = 175°C, T<sub>4</sub> = 260°C) with complex interplay between physical and crystallographic properties.

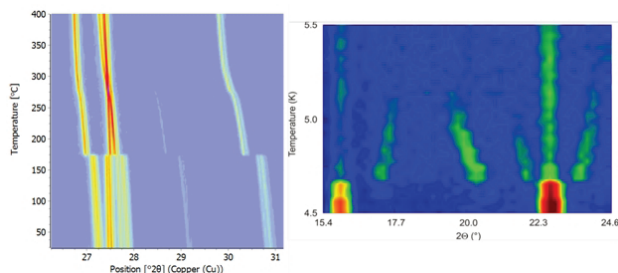
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**Figure 1.** Temperature dependence above room temperature (left) and at low temperature (right) of  $\text{RbMnPO}_4$  demonstrating the existence of 5 different phases in the explored temperature range.

**Keywords:** multiferroic, phase transition, magnetoelectric

## MS14-P10 Enamel microstructure and tooth embryonic development

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### INTRODUCTION

Tooth enamel is one of the most resistant inorganic components in the mammalian bodies that significantly affect both quality and life expectancy of an individual; it depends on the mutual arrangement of aggregates of the hydroxyapatite crystallites (Koenigswald & Clemens, 1992) and their characteristic properties. While the organization of aggregates is controlled by cooperation of cellular activity (ameloblasts) and pre-existing organic matrix (Boskey, 2007), the influence of Hap crystallites properties on the enamel quality has not been studied in detail up to now. In the present study we focus on the microstructure (i.e. crystallite size, micro-strain) of Hap of the laboratory minipig molars with different lengths of embryonic development stage and its implications for the final quality of the enamel.

### MATERIALS, METHODS

Samples from 20 minipigs (aged 16 - 108 mths) were studied. First, second and third molar of each individual were used to obtain teeth with the same dental function but with different length of embryonic development.

### RESULTS

While the crystallite size at  $1_{\parallel}/1_{\perp}$  direction increases from  $M_1$  to  $M_3$  for all samples studied, the micro-strain shows an opposite trend (Fig. 1). The prolonged period of  $M_3$  molar formation leads to enamel with lowest degree of lattice imperfection and, hence, arguably yields tooth with highest resistance to both mechanical and chemical damage and can perform its function for a long time period to ensure an adequate nutrition. Moreover, by comparing the young and old individuals, we showed that the enamel microstructure of individual molar types is time invariant.

### CONCLUSIONS

In the present study we showed that the effect of mechanical abrasion and/or the chemical degradation caused by the oral environment (hence the subject's age) on the microstructure can be excluded. We also demonstrated that the length of the tooth's embryonic development stage has a positive effect on the quality of its enamel.

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