(XRPD) patterns revealed the new compound to have a vaterite-type and warwickite-type structure, respectively. The modification with vaterite-type structure is known for other rare earth borates, for example, YBO$_3$ and YbBO$_3$, as a stable form. The warwickite-type phase is known for M$_3$O$_6$M$_2$OBO$_3$-type compounds. ScBO$_3$, was believed earlier to have calcite-type structure type only. Non-equilibrium processes during heating-quenching cycles lead to form new metastable phases in ScBO$_3$. We curried out detailed studies of ScBO$_3$ structural transformations by differential scanning calorimetry and in situ x-ray powder diffraction techniques. The quenched samples were characterized by IR spectroscopy, as well as XRD. We revealed that non-reversible sequence of amorphous→ warwickite-type→ vaterite-type→calcite-type transformations took place in the temperature range 1036-1054 K. Total exothermal effect for the amorphous→ warwickite-type→ vaterite-type transformations correspond to $\Delta H=142.4$ J/g and that of vaterite-type→calcite-type transition is $\Delta H=85$ J/g. The lattice parameters of the ScBO$_3$ warwickite-type structure are $a=9.4248$ Å, $b=9.4451$ Å, and $c=3.3969$ Å, $\beta=90.309$. S.G. = P2$\bar{1}$/n and ones of the vaterite-type structure are $a=3.8952$ Å, $c=7.8772$ Å, S.G. = P6$_3$/mmc, respectively. The details of the crystal structures will be discussed in the presentation.

The work had been financially supported by RFBR grant No.09-02-00363.

Keywords: complex oxides; nanomaterials; X-ray powder diffraction

FA2-MS02-P06

Mineral Apatite as a Periodic Model of Surface to Living Cell Growth. Marzena Suder, Malgorzata Tyszka-Czochara, Katarzyna Stadnicka. Jagiellonian University, Faculty of Pharmacy, Krakow, Poland.

A mineral apatite, Ca$_5$(PO$_4$)$_3$(F,OH,Cl) as a main source of phosphorus in nature, has a great importance in designing materials useful for medical purposes. Moreover, it is worth to say, that the mineral single-crystal apatites can obtain size up to several centimeters [1]. In comparison to above, a calcium deficient carbonate-hydroxyapatite suitable as a mineral part of vertebrates bones, occurs in shape of nano-sized crystals [1,2]. The hydroxyapatite, with a chemical composition similar to biological apatites and its proved biocompatibility, is broadly applied in medicine and stomatology [3]. It is interesting to what extend the different crystallographic orientation of the single-crystal faces has influence on living cell growth. Two types of geological crystals of different origin, with molecular formulas Ca$_3$(PO$_4$)$_2$(OH)$_{1.96}$(Cl) and Ca$_3$(PO$_4$)$_2$(OH)$_{1.45}$(Cl)$_{1.45}$, were studied. The material was characterized by various methods – polarizing microscopy, single-crystal X-ray diffraction and energy-dispersive X-ray spectroscopy for the evaluation of surface chemistry. In both cases lattice symmetry was found to be hexagonal with the point group P63/m and following unit cell parameters: $a=9.3839(4)$ Å, $c=6.8867(3)$ Å for (I) and $a=9.4058(4)$ Å, $c=6.8807(3)$ Å for (II). A basis to assume right model of the surface of the following faces: (10-10), (0001) and (10-11) was structural analysis. Subsequently, a chosen cell line of human fibroblasts has been grown on the prepared crystal plates with orientations (10-10), (0001) and (10-11). We hope that the studies will shed light on the understanding of living cell – apatite substrate interactions at atomic level.


Keywords: biomaterials; apatites; single-crystal X-ray diffraction

FA2-MS02-P07


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A mineral clay deposit from the locality “Guelma”, was investigated. The exploitation of the results of chemical, X-rays, IR and differential thermal analyses shows that the raw material is essentially formed with halloysite. Examined with S.E.M., the clay particles have a nanotubular form with 100 to 300nm in length and 20 to 50 nm in externall diameter. The activation energy of dehydroxylation was determined as 160 kJ.mol$^{-1}$, while the value for mullitisation is 844 kJ.mol$^{-1}$.

Keywords: halloysite; natural nanotube; kinetics of dehydroxylation

FA2-MS02-P08

Defects in Fluorite Structure Caused by Natural Irradiation. Vojtěch Vlček, Roman Škalá, Jakub Čížek, Jan Drahoňokoupl, Jan Valetna, Jana Ederová, Viktor Goliáš. Academy of Sciences of the Czech Republic, v.v.i. Institute of Geology, Prague, Czech Republic. Academy of Science of The Czech Republic, v.v.i., Institute of Physics, Prague, Czech Republic. Charles University in Prague, Department of Chemical Physics and Optics, Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic. Charles University in Prague, Department of Chemical Physics and Optics, Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic.

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