Inflation rules are not only a way to characterize the self-similarity of aperiodic structures (that is, tilings or patterns), but they are also used as a tool to construct yet unknown structures. The latter, however, has applied mainly to low-dimensional cases, while the use has been scarcely explored for three-dimensional icosahedral quasilattices (IQL's). In this paper, we make use of point inflation rules (PIR's) [1] for generating various IQL's of all the three Bravais classes (P, F and I-types). A PIR operates on a point set as firstly expand it by a scaling ratio of the underlying Z-module and secondly replace every point by an icosahedral cluster which is the prototype of the IQL. The Bravais class of the IQL is determined by the prototype cluster and the scaling ratio. It is a natural consequence of the method that the IQL will have a dense packing of the prototype clusters, while the atomic surface tends to exhibit a fractal boundary. [1,2] Note that the arrangement of the clusters are not based on any of the tiling models (e.g., the Ammann rhombohedral tiling). An extension of the method is presented where several different prototype clusters are used. Such an extension corresponds to introducing several different atomic surfaces on different special points of the six-dimensional icosahedral lattice. The widened range of IQL's that can be generated contains possible candidates that may be used for modeling real quasicrystals.
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Keywords: quasicrystal crystallography, theoretical structure modelling, aperiodic structures

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Study of stoichiometrich glass ceramics formation in the $BaO-Bi_2O_3-B_2O_3$ system

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Interest to $BaO-Bi_2O_3-B_2O_3$ system is connected to revealing new passive and active functional glasses and glass ceramics(GC). This system isn't investigated enough and its phase diagram is absent. The incongruent melted at 754ºC ternary $BaBiBO_4$ compound was synthesized and characterized recently by the solid-state sintering. Three ternary compounds were revealed in this system: congruent melted $BaBi_2B_4O_{10}$(730ºC) and $BaBiB_{11}O_{19}$(807ºC) compounds and $Ba_3BiB_3O_9$ compound which has phase transition at 850ºC and subsequent solid state decomposition at 885ºC. In the present work our attention has been concentrated on the study of stoichiometric ternary borates glass forming ability and the GC availability on their basis and the formed crystals characterization. The batches of all testing compositions were prepared from chemically pure grade reagents and were melted in quartz crucibles at 900-1000ºC in electrical furnace. Due to chemical analysis SiO_2 transition in glass melts at melting didn't exceed 2 wt. %. All compounds have good glass forming ability and form stable glasses. The temperature intervals and character of synthesized glasses crystallization and m.p. of formed crystals have been revealed from the DTA curves. Regimes of powder and bulk glass samples crystallization are studied and products of their crystallization are identified by X-ray analysis. The studies have shown that all stoichiometric glass basis are perspective for the GC with different functionality development: crystallized frits with high resistivity for packaging or covering on the ceramic or metallic plates; transparent nonlinear-optical GC.

Keywords: barium bismuth borate compounds, glass ceramics, stoichiometric glass basis

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Transparent glass-ceramics containing lead fluoride crystals

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Transparent glass-ceramics (TGC) as new host materials for rare earths have a great deal of interest due to their unique behavior like fluoride nanocrystals in oxide glass matrices. Heat treatment introduces transformation from glass to glass-ceramic, causing changes in spectroscopic properties like: narrowing of spectral lines and elongation in lifetimes of fluorescent states. Er-doped lead borate glasses before and after annealing were investigated using X-ray diffraction and luminescence spectroscopy. They present interesting spectroscopic properties in relation to NIR emission and up-conversion applications [1]. During heat treatment, TGC systems were obtained. Phase identification reveals, that crystalline peaks can be related to the orthorhombic lead fluoride phase, in contrast to other TGC systems containing cubic lead fluoride crystals [2].
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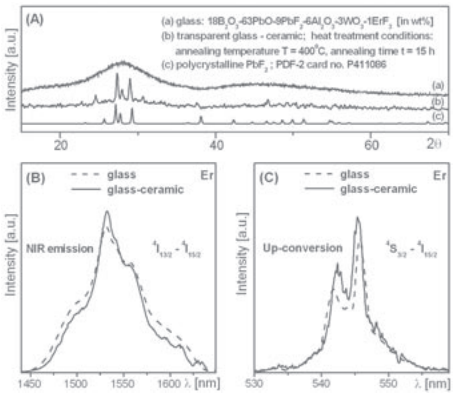

Keywords: glass-ceramics, X-ray diffraction, luminescence spectroscopy

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Influence of starting materials on hydrothermal synthesis of six-pointed starlike anatase aggregates

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Six-pointed starlike anatase aggregates were hydrothermally synthesized from aqueous mixtures of titanium tetraisopropoxide and tetramethylammonium hydroxide (TMAOH). It is noteworthy that though anatase has a tetragonal lattice, the anatase aggregates