framework upon dehydration/ rehydration processes, due to reversible movements of some organic moieties and hopping of some nickel atoms. The ability of MIL-77 inorganic network to accommodate glutarate derivatives was demonstrated by the use of 3-methylglutaric acid (3-MG) and 2-methylglutaric acid (2-MG). Moreover, we have shown that the handedness of the inorganic helices could be imposed by the configuration of the enantiopure 2-MG ligand. With cobalt ion, the synthesis of bulk homochiral solid has been confirmed by optical circular dichroism [2]. Here, we will summarize the structural features and the properties of this unique family of materials.


Keywords: porous solids, chiral compounds, thermal transformation

Fig. 1: View of the cubic (10, 3) chiral network

FA2-MS14-P16

Impact of pyroelectric LiNbO₃ and LiTaO₃ on water, organic dyes and E. coli. Emanuel Gutmann¹, Annegret Benke², Katharina Gerth³, Erik Mehner⁴, Christin Klein⁵, Udo Krause-Buchholz⁶, Wolfgang Pompe⁷, Dirk C. Meyer⁸, ¹Institut für Strukturphysik, TU Dresden, Germany. ²Institut für Werkstoffwissenschaft, TU Dresden, Germany. ³Institut für Genetik, TU Dresden, Germany. ⁴Institut für Experimentelle Physik, TU Bergakademie Freiberg, Germany.

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LiNbO₃ and LiTaO₃ materials of polar crystal structure exhibit a spontaneous polarization that can be changed by temperature (pyroelectric effect). This leads to the generation of surface charges which are neutralized preferentially by external screening charges attracted from surrounding media [1]. In this context, we have investigated the impact of thermally excited pyroelectric LiNbO₃ and LiTaO₃ on the redox behavior of noble metal salts, and organic dyes in aqueous solutions. Based on various experimental results such as gold salt reduction, methylene blue degradation and conversion of dichlorofluorescin diacetate, a reaction mechanism including electron transfer and subsequent hydroxy radical generation is proposed. Reaction rates strongly depend on the total surface of the pyroelectric particulate material in direct contact with the medium. As hydroxyl radicals are highly reactive oxidants used for disinfection purposes, also successful bactericidal tests with Escherichia coli have been performed.


Keywords: polar crystal, pyroelectric effect, hydroxyl radical

FA2-MS14-P17

Synthesis of new stoichiometric barium bismuth borates BaBi₁₂B₂O₇, BaBi₁₀B₆O₂₅, BaBi₈B₄O₁₀ and Ba₃Bi₃O₉. Martun Hovhannisyan⁹, Rafael Hovhannisyan⁹, Hovakim Alexanyan⁹, Nikolay Knayzyan, ⁹Scientific-Production Enterprise of Material Science, Yerevan, Armenia. ¹Institute of General and Inorganic Chemistry of NAS RA, Yerevan, Armenia.

Interest to ternary alkali free bismuth borate systems M,Oₓ-Bi₂O₃-B₂O₃ (M=Zn,Sr,Ca,Ba) studies has amplified recently. Various research groups worked in this area and revealed a number of ternary compounds, determined their structure, optical and nonlinear optical properties. Well known research groups payed special attention to BaO-Bi₂O₃-B₂O₃ system studies and have revealed four ternary stoichiometric BaBiBO₄ [1], BaBiB₂O₅, BaBi₁₂B₂O₇ and Ba₃Bi₃O₉ [2,3] compounds in it. Using methodology based on glass samples investigation was more effective at BaO-Bi₂O₃-B₂O₃ system phase diagram construction, than a traditional technique based on solid phase sintered samples studies. Because DTA curves of glasses, to the contrary DTA curves of solid state sintered samples, indicates their all characteristics temperatures, includes exothermal effects of glass crystallizations and endothermic effects of formed crystalline phases melting. Using different melts cooling rates we at first have determined large glass-forming field in the BaO-Bi₂O₃-B₂O₃ system, which includes all eutectics in the binary Bi₂O₃-B₂O₃, BaO-B₂O₃ and BaO-Bi₂O₃ systems and covers majority of the concentration triangles, reaching up to 90 mol% Bi₂O₃, BaO-B₂O₃, BaBi₂O₅, BaBi₃O₇, BaBi₁₂O₅, Bi₂B₄O₈, BiBO₃, Bi₃B₄O₁₀, BiB₂O₇, B₂B₂O₇, B₂B₄O₁₀, and B₂B₄O₇ compounds formed stable glasses. BaBi₂O₅, BaBi₃O₇, and Bi₂B₂O₇ compounds are in the area of glasses formed by high cooling rates (10⁴-10⁵)°C/s.

Phase diagrams construction have allowed us to reveal three new BaBi₁₂B₂O₇ and BaBi₁₀B₆O₂₅ congruent melted at 725 and 690°C respectively and BaBi₈B₄O₁₀ incongruent melted at 725 compounds in the BaO-Bi₂O₃-B₂O₃ system through same compositions glass crystallization, because all ternary compounds have enough glass forming ability. Single crystals of BaBi₁₂B₂O₇ were grown by cooling of a melt with the stoichiometric composition. Preliminary melted glass powder of the stoichiometric 11.11BaO-55.55Bi₂O₃-33.33B₂O₃ (mol%) composition was heated in an uncovered quartz glass ampoule up to 750°C at a rate 10K/min. After 2h exposition at this temperature, the melt was cooled at a rate 0.5 K/h. Single crystals with size up to 1.6×0.3×0.2 mm were grown. The X-ray characteristics of new compounds were determined. X-ray powder diffraction patterns of BaBi₁₂B₂O₇ and BaBi₁₀B₆O₂₅ could be indexed on an orthorhombic cell with lattice parameters as follows: for BaBi₁₂B₂O₇ a=11.818 Å, b=8.753 Å, c=7.146 Å, cell volume V= 739.203 Å³, Z=4; and