C.1. DESCRIPTION FOR THE GENERAL PUBLIC

The main objectives of the proposed research project are discovery and description of new minerals and new varieties of minerals with modular structures of the arctite type ("arctite group" – hexagonal antiperovskites with additional layers in structure) and elaboration of nomenclature and classification of the "hatrurite supergroup" (hexagonal antiperovskites). In the perovskite structure with the general crystal chemical formula ABX_3 (*sensu stricte* perovskite has formula $CaTiO_3$) A and X atoms show regular close packing and B cations occupy octahedral gaps. In antiperovskites cations and anions change places. Minerals of the "arctite group" have structure known as "broken" antiperovskite layered structure, where antiperovskite layers are interleaved with another type of layers. For instance, nabimusaite - mineral of the "arctite group" with formula $KCa_{12}(SiO_4)_4(PO_4)_2O_2F$, has structure with triple antiperovskite layers $\{[(O_2F)Ca_{12}](SiO_4)_4\}^{3+}$ interleaved with octahedral layers $K(SO_4)_2^{3-}$.

Proposed for realization project belongs to basic mineralogy, which in these days is not a classic descriptive mineralogy of the early XX century. So-called "mineral hunters" - scientists expanding our knowledge about mineral composition of the Earth and space bodies, nowadays must be experts in various fields of physics and chemistry of solids, because advanced methods and facilities are used in study of potentially new mineral species.

The objects of our study are different in mineral composition pyrometamorphic rocks of the Hatrurim Complex (Israel, Palestinian Authority, Jordan) and xenoliths occurring within volcanic rocks in Eifel (Germany), Kel' (South Ossetia) and Lakargi (Kabardino-Balkaria) formed at conditions of the sanidinite facies. Pyrometamorphic processes take place at very high temperatures and low pressures (natural fires, xenoliths in volcanic rocks, contacts of subvolcanic intrusions), and rokcs looked as fine-grained clinker-like ceramics are products of these processes. Ten-years' experience of the author of the proposal in elaboration of new minerals (since 2005 more than 40 new minerals were described), coming mainly from pyrometamorphic rocks, and methodology of work with very small phases developed by our team are a solid basis for a successful realization of the proposed project. We assume that an effect of byproducts of pyrometamorphism (gases, fluids, melts) on early minerals of the "clinker association", generated by many fire centers, leads to a significant increase of mineral species diversity in pyrometamorphic rocks. Detailed studies of pyrometamorphic rocks will lead without doubts to a discovery of new mineral phases and new varieties of minerals. Mineral differs from synthetic analogue by the fact that it forms in Nature. Determination of conditions and growth mechanisms during mineral crystallization in pyrometamorphic rocks will be also considered. Different types of isomorphic substitution in minerals of the "arctite group" define a high potential of this group in discovery of new mineral species. At the first stage during project realization an elaboration of potentially new minerals of the "arctite group" discovered in 2016 in spurrite rocks in the Negev Desert, Israel with the crystal chemical formulae $BaCa_{12}(SiO_4)_4(PO_4)_2F_2O$ and $BaCa_6(SiO_4)_4[(PO_4)(CO_3)F$ is planned.

At present there are 7 known minerals with the antiperovskite structure having additional layers and two potentially new minerals with the formulae $BaCa_{12}(SiO_4)_4(PO_4)_2F_2O$ and $BaCa_6(SiO_4)_4[(PO_4)(CO_3)F$. If we add some new minerals, which will be found during project realization, it will be clear that it is necessary to working out a nomenclature and classification of minerals with the arctite type structure and general systematics of the "hatrurite supergroup" (hexagonal antiperovskites). The published at the end of 2016 a classification of the perovskite supergroup does not consider hexagonal antiperovskites (Mitchell et al., 2016).

There is no doubt that discovery and description of new minerals with the hexagonal antiperovskite structure and elaboration of nomenclature and classification of the new "hatrurite supergroup" will be a significant contribution to the world mineralogy and related fields such as physics and chemistry of solids, crystallography and materials science. Every the next new mineral discovered by our team or our colleagues from Polish research institutions not only broadens our knowledge about mineral composition of the Earth and other space bodies, but it is also an opportunity to promote Poland in the world.