**Nanomaterils Research Centre** http://www.ksc.ru/instituty/tsentr-nanomaterialovedeniya/

NRC KSC RAS is an intensively developing "network" scientific subdivision formed in 2010 on initiative of academician V.T. Kalinnikov, to carry out interdisciplinary researches on mineralogy, crystallo-chemistry and materials science. The staff of the Centre consists of mineralogists (Geological Institute, KSC RAS), crystallographers (Saint-Petersburg University) and chemical engineers (Institute of Chemistry and Technology of rare elements and mineral raw materials, KSC RAS). The Centre is headed by Anatoly Ivanovich Nikolayev, State prize laureate of the Russian Federation, a corresponding member of RAS.

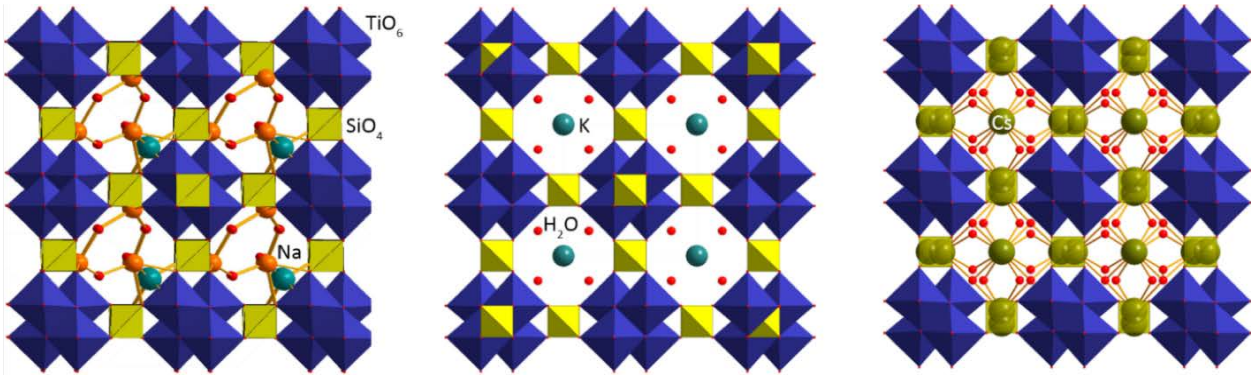
Meeting on organization of the NRC KSC RAS, 2010. (left to right): A.I.Nikolayev, a corr.-membe, RAS (Head of CNM KSC RAS), S.V.Krivovichev, a corr.-member, RAS (p.r.a., CNM KSC RAS), academician, RAS, V.T.Kalinnikov, G.Yu.Ivanyuk, Dr.Sc.(Geol.-Mineral.), (p.r.a., CNM KSC RAS)

The Centre's research tactics is based on a detailed mineralogical investigation of unique geological complexes of the Baltic shield, the aim of which is to search new minerals – the prototypes of functional (nano)materials , study in detail the minerals discovered with the help of up-to-date methods , study their non-linear-optical, catalytic, luminescent, electric, ion-exchanging, molecular- sieve and other important , from practical viewpoint, properties, as well as determine the conditions of their formation in nature in order to develop methods used to produce the corresponding functional prototypes and determine the potential of their use.

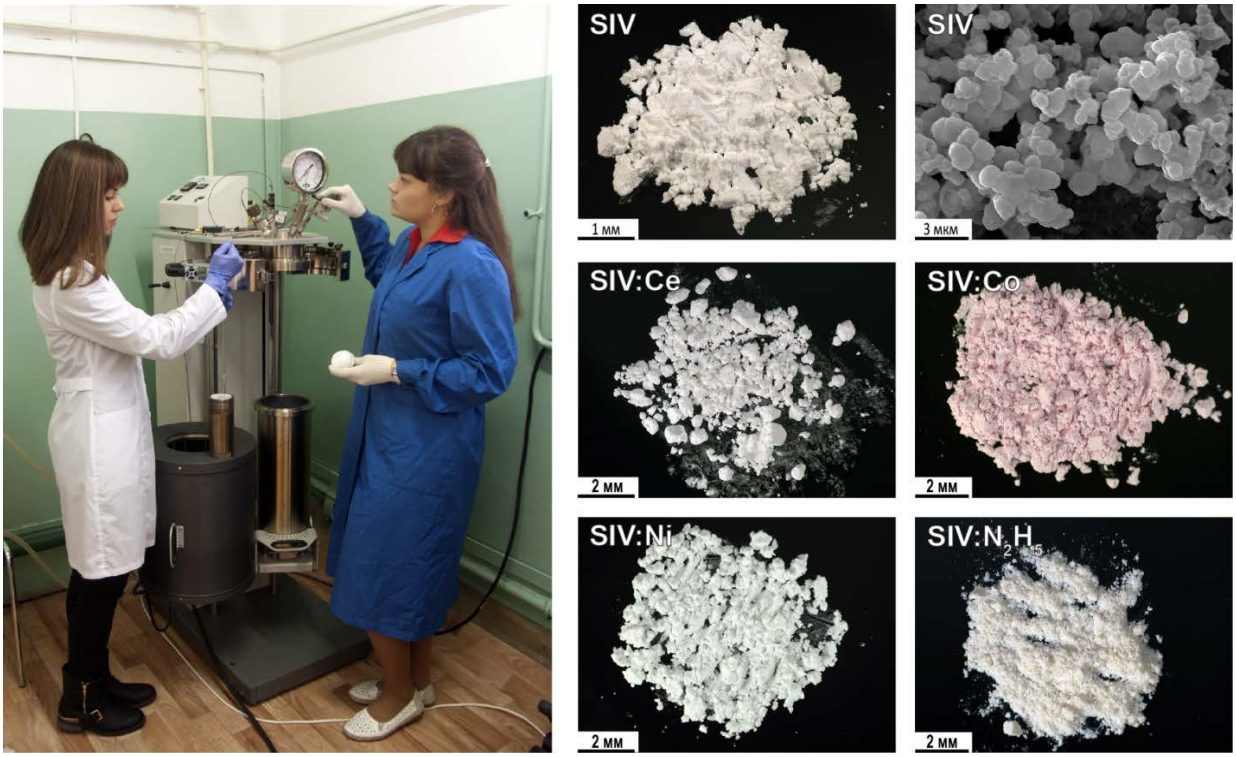
The purpose-oriented search of new mineral types (over 50 units) is carried out according to the original approaches, being based on the theory of self-organization, methods of machine-training and spatial analysis of large body of information.
As of July 1, 2018, the scientific staff of the Centre consists of 2 corresponding-members of RAS, 5 Doctors of Sciences, 9 Ph. D. research associates with, and 3 post-graduates. Within the period of 2013-2018, the scientists of the Centre have more than 50 articles published in international journals with the Index Web of Sciences, have got 9 patents of the Russian Federation and obtained over 50 mln rubles as research grants and economic agreements with Apatit JSC and Kol'skaya GMK Company).

The scientists of the Centre have for the first time determined more than 200 crystalline textures of natural and synthetic compounds, developed new approaches to analyzing the regularities in their formation (the theory of texture complexity, anion-aligned complexes, etc)

and new methods for production of functional compounds (titanosilicate nanoblocks self-assembling according to the scheme " monocrystall into monosrystall", etc.)




Cryslalline textures of ivanyukite-Na-T, ivanyukite-K and caesium exchange form of natural ivanyukitepNa-T




Hydrothermal synthesis (left) and general view of SIV and its exchange forms (right)

The experiments on treatment of model and actual waste produced by nuclear power plants and non-ferrous metallurgy with the help of mineral-like materials developed allowed the potential of their practical application to be determined.

In particular, a promising technology has been developed for joint and sequential removal of most radionuclides from LRW and vat still residue produced in nuclear reactors, with the help of SIV, LHT-9, SL3:Ag, followed by spent sorbent processing to produce stable CynRoc titanate ceramic (rutile, pyrochlore, hollandite, hausonite, etc.).

Also developed are technologies for selective recovery (joint or sequential) of noble metals from industrial solutions of copper-nickel production with the help of SIV:$N_2H_5$ , and technologies to remove silver from industrial electrolytes used in copper refining, with the help

of SL3, with the SL3:Ag produced being possible to be used in selective recovery of iodine from air and water solutions.


Radionuclide 90Sr and 137Cs processing to produce titanate SynRoc ceramic, with the help of SIV. 1 – leucite-like phase $(Cs, K, Sr)_{1-2}Si_4Ti_2O_{13}$, 2 – pyrochlore-like phase фаза $(Cs, Sr)_{2-4}Si_2Ti_3O_{12}$; 3 – tausonite; 4 – hollandite-like phase $CsTi_8O_{16}$