

1. The project goal

Mineralogical recognition of an unique granitic pegmatite in Lower Silesia, extremely enriched in Sc-bearing mineralization along with the description of a few new scandian minerals and exploration for a source of Sc in the locality is the main purpose in the research project. The studies of new phases should make possible the application of the potentially new minerals to, and their approval as valid species by the Commission on New Minerals, Nomenclature and Classification of the International Mineralogical Association (IMA-CNMNC).

2. Reasons for attempting a particular research topic and description of research

Why the mineralization is important for geological sciences and worth research studies? Scandium, as the lightest rare-earth element is not rare in Earth crust, but it is distributed sparsely occurring usually as trace isomorphic admixture in many rock-forming and ore minerals, in which it substitutes for Fe^{3+} , Mg^{2+} , Al^{3+} , Ti^{4+} , Sn^{4+} , Zr^{4+} , Ta^{5+} or W^{6+} . As a result, the element is a very rare constituent of minerals and currently only 19 mineral species of Sc are known, 3 of them being recognized only in meteorites. Therefore, localities rich in Sc mineralization are exceptional and occurrences with a greater number of Sc minerals are scarce. The best known are the Heftetjern pegmatite in Norway with 7 Sc minerals described, and intragranitic pegmatites of the Baveno region in Italy hosting 6 Sc mineral species. The occurrence of Sc-bearing mineralization in one of the Lower Silesia pegmatites may be regarded as an exceptional world-class locality, because preliminary investigations of the pegmatite disclosed the presence of at least 6 Sc phases (including 3 potentially new species) and many other more common minerals that display a considerable enrichment in Sc. Moreover, the mineralization is slightly different of those from Norway and Italy, because it is partly composed of typical rock-forming minerals (diopside, amphibole, epidote) enriched in Sc to degrees never found to date on Earth and sometimes comparable only with Sc-enrichment in the extraterrestrial silicates! Therefore, our proposal is focused on (1) detailed mineralogical and geochemical investigations of the Sc-bearing assemblages in the pegmatite as well as in the associated rocks, (2) determination of the processes responsible for the formation of this unusual mineralization and a possible source of Sc, (3) determination of the age of the pegmatite, which should place its formation in the frames of regional processes that took place in the surrounding geological units, i.e. metamorphic and anatexis events in the Góry Sowie Block, granitic magmatism in the Niemcza Zone and intrusion of the Strzegom-Sobótka massif.

Successful realization of the project proposal will require field works that are necessary to search for more pegmatitic material as well as to sample the associated rocks for detailed geochemical and mineralogical studies, and complex laboratory investigations focused on (i) chemical, microprobe studies of all the Sc phases as possible new minerals along with mineralogical, geochemical and age characteristics of their hosts, and (ii) structural investigations realized on microsamples of the Sc minerals by single-crystal structure refinement, optionally electron-back-scattered diffraction or transmission electron microscope diffraction.

3. Substantial results expected

The mineralogical, geochemical and age recognition of the pegmatite along with geochemical recognition of surrounding host and the description of new Sc mineral species and their approval by the IMA-CNMNC, first of all will add to the development of mineralogical sciences. The Sc-rich pegmatite can also be regarded as a case study of the interaction between geochemically evolved felsic melts and ultrabasic and basic rocks of ophiolitic provenance, which would certainly be of interest for researchers working in different fields of Earth sciences, namely petrologists, geochemists and mineralogists. Processes resulting in the formation of Sc-rich mineral assemblages would also be of interests for ore geologists. For specialists dealing with the Sudetic section of the European Variscides, the important aspect of our studies would be the contribution to the knowledge on the regional geology and on the pegmatite-forming processes in the Sudetes. Moreover, the recognition of a new mineral species is fundamental not only for geological sciences, but also for solid state chemistry and physics, crystallography and material sciences. Very often newly described minerals provide valuable chemical and structural information for the development of new materials with applications in modern industries. In general, newly-acquired knowledge about naturally occurring inorganic compounds is an invaluable contribution to the development of Science.