

Classification and quantification of Estonian phosphorite deposits and their REE potential

Summary

Taltech School of Science, Department of Geology, Mineral Resources Research Group offers a 4-year PhD position in Physical Sciences

Research field:	Earth sciences
Supervisors:	Rutt Hints Michael William Hitch
Availability:	This position is available.
Offered by:	School of Science Department of Geology
Application deadline:	Applications are accepted between June 01, 2020 00:00 and July 03, 2020 23:59 (Europe/Zurich)

Description

The Cambrian-Ordovician the rare earth elements (REE) containing shelly phosphorites from Estonia are the biggest unexploited phosphorite resources in Europe. Several such deposits were discovered, explored and locally mined during the last century.

These stratiform, low-grade and high-tonnage deposits, accumulated in coastal and shallow marine sand bodies. They are rich in fragments of phosphatic brachiopods, however, are internally rather heterogonous. Previous studies indicated complex internal changes in phosphate grade, cement type and potentially in REE abundance. For resource volume calculation and mineral processing purposes several phosphorite ore types have delineated, based mainly on occurrence of dolomitic cements and iron compounds.

Previous, Soviet-era studies fall short in explaining spatial distribution of recorded resource heterogeneity internally in limits of single deposit as well as between the deposits. Moreover, there is a lack of systematic record on spatial variability of potentially important by-product of phosphorite mining such as REE. The latter where likely enriched in apatitic shell fragments in the sea bottom, with seawater as the primary source of the metals, but their content variations in phosphorite complexes remain poorly understood.

The proposed project would develop a characterization scheme for these phosphorite deposits providing better predictive power. This work requires combining information from different study fields including sedimentary facies characteristics (geometries, lithology, degree of fragmentation of phosphatic fragments), spatial variations in apatite geochemistry, extent of late diagenetic overprinting.

Responsibilities and tasks:

- Compile existing data and evaluate historic observations in terms of what are definitive features of phosphorite deposits (this may require evaluating literature from similar deposits elsewhere globally) (i.e. establish a characterization criteria)
- Determine sample localities based on known/historic data for localized shallow drilling and sample collection
- Prepare samples for paleontological, petrographic and geochemical analysis and review
- Establish a classification scheme for phosphorite deposits in Estonia

The PhD position is available for a 4-year period and the key tasks as a PhD student at TalTech include:

- To manage, operate and complete an independent research project
- Attend required graduate-level courses
- Write/Author three (3) peer reviewed scientific journal papers, based on your research outcomes and conclusions
- Participate in teaching undergraduate courses in the Department of Geology

Qualifications

The applicants should fulfill the following requirements:

- General admission criteria:
 - An earned Bachelor's and Master's degree (by research) from an internationally recognized university in the area of Geosciences
 - English proficiency at a minimum IELTS band of 6.5 in all areas with no component below 6.0, or equivalent
- Specific candidate requirements:
 - The candidate needs to be a highly motivated earth science graduate, capable of working independently in an office, classroom, laboratory and field setting
 - It is important that the candidate has prior knowledge and experience in sedimentary petrography, paleontology, and familiar with geochemistry
 - The written skills and prior publication history will be an important criterion when selecting the appropriate candidate. It is essential that the successful person is a motivated scholar and can synthesise multiple data sets and historical data



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