

DESCRIPTION FOR THE GENERAL PUBLIC OF THE PROJECT:

“Mechanisms of glauconite weathering in soils of temperate climate”

Glauconite is a green iron rich potassium mica belonging to the so called clay minerals (i.e. naturally occurring finely crystalline layered silicates). Glauconite forms in marine environment at low latitudes. It commonly occurs in sediments and sedimentary rocks of different ages. When glauconite formed in marine environment is exposed, due to geological processes, to conditions met near the Earth surface it undergoes weathering (i.e. it is transformed into other phases which are more stable in the surface conditions). Mechanisms of glauconite formation have already been described in a vast number of publications, while weathering of glauconite has not been extensively studied and appears to be poorly understood. The main goal of the research proposed is to recognize the mechanisms of glauconite weathering taking place in temperate climatic conditions. The goal is expected to be achieved by application of detailed mineralogical studies to the carefully selected set of soil profiles developed on glauconite – bearing rocks. Until now several promising sampling sites have been recognized. The results obtained for these soils are expected to give an idea on the influence glauconite chemical composition as well as physical and chemical soil properties, on the mechanism of the weathering.

The basic research methods will include:

- Field soil profile description and sampling.
- Sample preparation for instrumental analyses (drying, sieving, separation of sand, silt and clay fractions, electromagnetic separation of subfractions according to the iron content).
- Mineralogical instrumental analyses of glauconite and separated sub-fractions (i.e. X-ray diffractometry (including detailed clay minerals analysis) and infrared spectroscopic analyses).
- Observations of samples using optical microscope.
- Observations and chemical analyses of selected samples using scanning electron microscope equipped with chemical - microanalysis system.
- Determination of ferric and ferrous iron in selected samples using Moessbauer spectroscopy.
- Precise chemical analysis of selected samples.
- Analyses and interpretation of data obtained performed using a variety of advanced software: (e.g. JMicrovision, ClayLab (Sherlock), Autoquan/BGMN, Origin, Fityk, MsExcel, Sybilla i MOSGRAF).

The results obtained in the proposed research are expected to be of great interest for clay mineralogy. Glauconite commonly occurs in soils developed from sediments and sedimentary rocks. Thus recognition of glauconite weathering mechanisms is of great importance for understanding of general environmental iron and potassium cycle. The mineral is also the main component of the so-called greensands – “organic” (i.e. natural) fertilizers which are used as a source of potassium and iron easily accessible for plants. Greensands are being commonly added to crop soils because of the current popularity of the “organic” fertilizers. For this reason, the mechanism of glauconite weathering is of great interest for global community because it may potentially influence chemical properties of arable soils. It is also of great interest for polish community due to the fact that exploitation and likely production of glauconite based fertilizers is planned to be started in Poland in the nearest future.