

Development of a new dating method for magnesite deposits in the Paleozoic of the Eastern Alps (Northern Greywacke Zone, Austria)

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Alpine magnesite deposits are of great economic value. Their genesis is still the subject of controversial discussions. Two opposite theories about the formation of magnesite of the Veitsch-Type, named after the type locality in the Northern Greywacke Zone, Austria, have been developed. Several attempts are done to bring up evidences to verify one of the two contracting theories. However there is yet no agreement about the genesis of sparry magnesite deposits. The age determination of the ore producing processes turns out to be extremely difficult. Attempts of dating with the Sm/Nd-method yielded results, which cannot be correlated with tectonic processes within the Alps. Our approach will combine field data and new laboratory methods to gain a model for dating ore deposits formed during low temperature induced fluid transport processes. Identifying growth generations by accurate investigations of thin sections will avoid so-called mixing ages. Probably these mixing ages originate from whole rock analysis, without consideration of different growth generations at microscopic scale. Therefore dated rocks show ages which cannot be correlated with tectonic processes. By taking the microscopic growth generations into consideration a spatial resolved dating technique will provide the opportunity to gain crystallization ages of the magnesite deposits. Embedding these ages in the regional geology of the Northern Greywacke Zone the deduction of a model for the genesis of magnesite deposits is intended.

Following geologically controlled sampling in the field and thin section studies, analysis of magnesites using cathodoluminescence and electron microprobe are projected to detect single-phase crystallized zones or phenocrysts. By means of preparation techniques in spatial resolution, these single-phase crystallized zones are to be selected for geochemical investigations in order to determine the trace element content. With an adequate amount of samarium, neodymium, lutetium and hafnium radiometric dating using the Lu/Hf- or Sm/Nd-method is planned. The development of an appropriate dating technique for reliable age determinations of hydrothermal induced ore formation is a central part of the task.

Regionally, the comparison of all known deposits within the western part of the Paleozoic of Greywacke Zone is intended. Official mapping by the Geological Survey of Austria, carried out in the past 30 years, provides access to high resolution structural, stratigraphic and sedimentological data. The development of a summarizing geodynamic model of magnesite deposits through the integration of obtained laboratory data with field data is aimed.

There exists a clear demand for fundamental research in geochronological dating within the carbonate-system calcite/dolomite/magnesite. In case of progress and success, problems of general interest, e.g. dating of diagenetical processes, fluid transport during low grade metamorphism and ore deposit formation can be addressed.