GEOCHEMOMETRICAL CONTRIBUTIONS TO THE METALLOGENETIC MAP OF AUSTRIA.

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The concept of geochemometry, based on the combination of chemical and isotopic data, aims at the development of ore deposit models and genetic classifications in an objective way (Schroll et al., 1994, 1997). Data received from the investigations of fluid inclusions and age determinations enlarge the amount of data. The obtained data system represents a complex network of relations between geochemical, crystal chemical and physico chemical conditions of the formation of geological bodies .

The first test started following the idea of „geochemical guide elements" to group the lead and zinc bearing ore deposits of the Eastern Alps. The dependency from geological setting could be clearly shown (Schroll, 1955). More than forthy years later geochemical data, so far as available, have been used sucessfully for the classification and for the constraints of genetic models compilating the metallogenetic map of Austria (Schroll in Weber,1997).

The use of data of a single characteristic can cause wrong interpretations. The analysis of one component only may be sufficient, but not constraining for the interpretation. For instances, the determination of sulphate sulphur isotopes is a helpful tool to classify evaporites, especially to distinguish betweeen Permian and Scythian-Anisian sea water sulphates. However, the isotopic composition can be influenced by diagenetic processes or mixing. Additionally, a second significant characteristic, sc. the strontium isotope ratio, is necessary for differentiation. The sulphate sulphur composition of barytes is more critically to evaluate. The signature of Devonian seawater are to await in the stratiform barytes from the Graz Paleozoic controlled by the contemporal strontium isotope ratio and the significant low strontium content. The sulphur isotope value of the most other barytes are marked by contemporal seawater, but the time of the mineralization itself could be younger.

Nevertheless, the frequency distribution of univariant data is the absolutely necessary test for homogeneity or heterogeneity not only basically for the application of the other statistic methods, but it is of genetic interest too. For instances, the homogeneity of the isotopes of the ore lead from the Bleiberg type points to the origin from a well mixed source, while the large spread is characteristic for the activity of metamorph water caused by the addition of excess radiogenic lead, such as in ore lead of the tungsten district Felbertal or of the gold mineralizations of the Hohe Tauern. Density diagrams concerning geochemometrical data of the lead -zinc deposit Bleiberg or some pre-Alpidic deposits show at least three peaks, indicating the complex history of their genesis caused by diagenesis or metamorphism.

Bivariant presentations of carbon and oxygen isotopes have been used for the characterization of carbonates , like magnesite and siderite discriminating the gentically different types. The supply of isotope data of siderites is still limited excepting the Erzberg in Styria. Additional data, especially the strontium isotopes too ,are important for constraining interpretations.

The fluid inclusion investigations and the reconstruction of the isotope composition of the ore fluids are a promising way to characterize deposits and to contribute to genetical aspects. According to geochronological data Alpidic activities of ore mineralizations are note around 30, 80, 15o and 200 up to 240 Ma. But the pre-Alpidic memories of fluids seem to be lost.

Unfortunately, the data base is still insufficient for the application of the multivariate techniques. Only for the well-explored Triassic carbonate-hosted lead-zinc deposits the use of multivariate geochemical discrimination was applicable. The affinity and, nevertheless, the temporal difference between ore mineralizations of Anisian and Carnian stage could be demonstrated. The diversity to the classical MTV-deposits is convincingly displayed (Schroll et al.1994)

The geochemometrical studies will be continued and a pilot project is in progress comparing ore deposits of the Eastern Alps and the Western Carpathians (see poster in this session, Andras et al.).

References: Schroll, E (1955): TMPM 5, 183-208; Schroll, E., Kürzl, H.&Weinzirl, O. (1994): Spec. Publ. SGAE 10, 228-245, Springer Verlag and BHM 141/4, 158-164; Schroll, E. in Weber, L.(1997): Arch. Lagerst.forsch. GBA 19, 365-544.