

formation, i.e. the initiation of the Prespa Basin occurred well before the formation of the Ohrid Basin.

## **The stable isotopic composition of cryptocrystalline magnesite occurrences in Turkey and Austria and implications for their origin**

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Cryptocrystalline magnesite occurs predominantly in ultramafitic rocks of ophiolite sequences and associated sediments. Two types are recognized, the Kraubath type (KT), which occurs – tectonically controlled – in ultramafic rocks as veins, networks and zebra ore, and the Bela Stena type (BST), which occurs as nodules and layers in sediments.

The two types not only differ by the nature of their host rock but also by their C and O isotopic composition. The KT has lower C isotope values (-18 to -6‰ VPDB) than the BST (-1 to +4‰ VPDB).  $\delta^{18}\text{O}$  values of both types overlap, whereby the KT shows a tendency to lower values (+22 to +29‰ VSMOW) than the BST (+26 to +36‰ VSMOW).

This study is based on extensive fieldwork and a total of 320 samples from Austria (Kraubath) and Turkey (western and eastern Anatolia).

Kraubath (Austria) contains the lowest C isotope values (-22.5 to -11.3‰ VPDB). Turkish KT magnesite contains higher C isotope values (-12.7 to -3.1‰ VPDB). Turkish BST magnesite contains mainly positive C isotope values (+1.5 to +6.9‰ VPDB) with the exceptions of Dutluca and Bahtyiar (Eskişehir/Western Anatolia)

In the operated magnesite deposit of Dutluca (Eskişehir/Turkey) KT magnesite and zebra ore (-10.6 to -7.8‰ VPDB) are covered by sediments with BST magnesite, which occurs as nodules and layers (-6.5 to -5.8‰ VPDB).

The deposit of Bathyiar (Eskişehir/Turkey) shows a transition from network to iron-rich zebra ore and BST. The network shows normal isotope values, but the  $\delta^{18}\text{O}$  values of the zebra ore are extraordinary high (+29 to +35‰ VSMOW).

The  $\delta^{18}\text{O}$  values of KT magnesite suggest general formation temperatures between ca. 60 and 70°C. Exceptions are the deposits of Tavşanlı/Turkey, which formed at temperatures of ca. 80°C. Zebra ore of Bathyiar (Eskişehir/Turkey) formed at temperatures below ca. 30°C.

The range of the  $\delta^{13}\text{C}$  values (-22.5 to +6.1‰ VPDB) suggests that  $\text{CO}_2$  was derived from several sources (biogenic – atmospheric, decarboxylated, mantle-derived or magmatogene) and was transported by meteoric waters. Supergene water with dissolved  $\text{HCO}_3^-$  invaded the serpentinite and leached  $\text{Mg}^{2+}$ . The release of  $\text{Mg}^{2+}$  and  $\text{OH}^-$  into the solution raised the pH. Extension of strike-slip system provided pathways for migration and the formation of hydrothermal convection cells. At shallow levels the drops in  $\text{pCO}_2$  due to outgassing caused supersaturation and formation of magnesite.

## **The Tokaj Mts. obsidian – its use in prehistory and present application**

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Homogeneous acid volcanic glass of low water content has been an object of human attention since the prehistory. There exist archaeological evidences dealing with the use of obsidian from the Tokaj Mts. (eastern Slovak Republic and the north-eastern part of Hungary, as well) Late Tertiary volcanic province in the Late Palaeolithic. There at present exist