

STUDY OF HYDROTHERMAL VEINS WITH AXINITES FROM THE WESTERN CARPATHIANS

OZDÍN, D.¹, VOLEK, M.² & ŠTEVKO, M.¹

¹ Department of Mineralogy and Petrology, Faculty of Natural Sciences, Comenius University, Mlynská dolina G, 842 15 Bratislava, Slovak Republic

E-mail: ozdin@fns.uniba.sk

² Karpatská 22, 90001 Modra, Slovak Republic

In the Western Carpathians two genetic types of axinite are found. Axinites occur in hydrothermal veins with characteristic Alpine-type paragenesis in metamorphic rocks (localities Limbach, Jasenie, Gretla, Čučma, Gemerská Poloma, Košice and Miskolc) or in contact zone of granitoids with sedimentary (Modra) or volcanic rocks (Vyšná Šebastová near Prešov). We studied axinite from five localities from Slovakia and one from Hungary (Miskolc) using electron microprobe and fluid inclusion study.

(1) Locality Limbach is situated in the Malé Karpaty Mts. near Bratislava and is formed by hydrothermal veins in grey-green metabasites. Hydrothermal veins contain mostly light brown ferro-axinite, albite and calcite; acicular actinolite, quartz, pyrite, chalcopyrite etc. are rare. This ferro-axinite is the richest in magnesium in the Western Carpathians, it contains up to 2.88 wt. % (0.40 *apfu*) Mg. Homogenization temperature (Th) is in the 133–204 °C range (mean = 158 °C), ice melting temperature (Tm) is in the –2.8 to –12.9 °C range (mean = –9.18 °C). Average salinity of fluid inclusions is 12.8 NaCl equ. wt%. Average size of fluid inclusions is 18 µm.

(2) Hydrothermal veins on the locality Čučma (dump of Gabriela adit) and Čučma-Grexa (3) occur in the Early Paleozoic porphyroides in the Spišsko-gemerské rudohorie Mts. Various mineral assemblages are present at the locality Čučma. We described actinolite, quartz, dravite, chamosite, orthoclase, albite, calcite, zircon, titanite and fluorapatite. From among sulphides molybdenite, sphalerite, gersdorffite and pyrite occur. The axinite group is represented by ferro-axinite with Fe ↔ Mg substitution. This ferro-axinite contains only 0.3–0.8 *apfu* Mn. As a peculiarity of this mineralization the very rare overgrowth of two borosilicates, dravite and ferro-axinite can be mentioned.

(3) On the locality Grexa axinite occurs with magnesiohornblende, quartz, calcite, annite, chamosite, titanite, dravite, schorl and minerals of the epidote group. The chemical composition of axinite is very variable and varies from prevalent ferro-axinite to manganaxinite. The content of Fe is in the range 0.45–0.96 *apfu*, Mg 0.06–0.39 *apfu* and Mn 0.08–0.57 *apfu*. We determined two characteristic substitution trends. In the first one Fe is replaced by Mg and in second substitution trend is Fe replaced by Mn.

(4) Dark green actinolite and dark brown axinite are the most abundant minerals in hydrothermal veins in the amphibolitic schists at the locality Gemerská Poloma (Pintiková valley). These two principal minerals are associated with andradite, quartz, calcite, fluorapatite, titanite, allanite-(Ce), zircon, cobaltite and gersdorffite. Chemical composition of axinite is variable and varies from ferro-axinite to prevalent manganaxinite (Fe 0.42–0.57 *apfu*, Mn 0.44–0.64 *apfu* and Mg 0.09–0.14 *apfu*). Zoned crystals of axinite from this locality have usually Fe-rich core (ferro-axinite) and Mn-rich rim (manganaxinite). Fluid inclusion study of manganaxinite indicates that axinite originated from highly saline fluids. Th values are 120–233 °C (mean Th 183 °C), Tm value is in the –26.1 to –13.5 °C range (mean –20.3 °C). Average of salinity of fluid inclusions is 22.2 NaCl equ. wt%. Average size of fluid inclusions is 11 µm. Th of associated quartz is in the 120–58 °C range (mean 136 °C), Tm of quartz is in the range –2.8 to –21.9 °C (mean 14 °C) and the average salinity is 18.36 NaCl equ. wt%.

(5) Axinite from the locality Košice-Bankov forms isolated grains in chloritic schists. The studied sample originated from the KV-2 borehole. According to microprobe analyses it is a homogenous ferro-axinite with major substitution Fe for Mg or Mn.

(6) Calcite–quartz–albite veins with axinite were described from Miskolc-Lillafüred by SZAKÁLL & FÖLDVÁRI (1995). These veins occur in metabasalt rocks. According to its chemical composition the mineral in question is ferro-axinite and its content of divalent cations (in *apfu*) is as follows: Fe 0.49–0.73, Mn 0.09–0.35 and Mg 0.21–0.38. Ferro-axinite from Miskolc is mostly chemically homogenous, but some crystals are zoned. The cores and the rims are enriched in Fe and Mg, respectively. On the basis of 20 wavelength dispersive microprobe analyses the relatively large scatter of the analytical values of ferro-axinite may correspond to two probable substitution trends. The first one is Fe ↔ Mg and the second is Fe ↔ Mn.

Reference

SZAKÁLL, S. & FÖLDVÁRI, M. (1995): Földtani Közlöny, 125: 433–442.