DIAMONDS AND Fe-CARBONATE INCLUSIONS IN GARNETS FROM PELITIC GNEISSES OF THE ULTRA-HIGH PRESSURE METAMORPHIC KIMI COMPLEX IN CENTRAL AND EAST RHODOPE GREECE

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Micro-Raman investigation on diamond inclusions in garnet from pelitic garnets of the UHP metamorphic Kimi complex in Rhodope, revealed two types of diamonds. Microdiamonds with a typical sharp peak at 1332 cm^{-1} and FWHM 3.5 to 5 cm^{-1} and diamonds with a broad peak at 1333 cm^{-1} with FWHM from 21 to 29 cm^{-1} interpreted as nanodiamonds. They are associated with an additional peak at 1308 cm^{-1} interpreted by PERRAKI et al (2005) as possible lonsdaleite(?). Microdiamonds occur either as single crystal grain inclusions in garnets or most frequently, they are associated with a carbonate phase. Nanodiamonds are present in composite inclusions in garnet, consisting of CO_2 + nanodiamond, CO_2 + nanodiamond + carbonate, CO_2 + nanodiamond + carbonate + mica (possibly phengite) and nanodiamond + carbonate + phengite.

Raman spectra of the carbonate inclusions are characterized by peaks at 1086 – 1090 cm^{-1} for the V1 vibration and at 287 – 296 cm^{-1} for the lattice mode vibration. Microprobe analyses on carbonate phases of inclusions exposed to the surface of polished thin sections showed that the carbonates are predominantly siderites with substitutions of Fe^{2+} mainly by Mg and less by Ca and Mn. Another type of carbonate inclusions in garnet was also detected, though this type is rarely in association with nanodiamonds. It is characterized by Raman peaks at 1090 – 1094 cm^{-1} for the V1 vibration and at 305 – 318 cm^{-1} for the lattice mode vibration. Microprobe analysis showed that this type is a Fe-Mg carbonate with much higher Mg content than the former one.

The coexistence of siderite with micro- and / or nanodiamond, CO_2 and phengitic mica in garnet inclusions of the metapelites in Rhodope metamorphic province indicates that diamond is crystallized from C-O-H + silicate supercritical fluids/or melts rich in Fe, Al, Mg, and less in K, Ca and Mn. Such fluids can be formed by dehydration melting at the peak P-T conditions or at the first stages of decompression but still at UHP conditions. Supercritical C-O-H (+ silicate) fluids for diamond crystallization are also referred by STÖCKHERT et al. (2001) and DOBRZHINETSKAYA et al. (2003) in Erzgebirge and Kokchetav massif respectively.

References

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