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Carbonic fluid inclusions in amphibolite-facies rocks from Bodonch area, western Mongolian Altai

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The Central Asian Orogenic Belt (CAOB), also known as Altaids, located between the Archean Siberian Craton to the north and the Tarim and North China Cratons to the south, is regarded as one of the largest accretionary and collisional orogen in the world. The Altai Orogen in the southwestern margin of the CAOB extends from Russia and East Kazakhstan to the west, through Northern China, to southeastern Mongolia to the east. It contains various volcano-sedimentary rocks that were deformed and metamorphosed under various pressure-temperature (P-T) conditions from greenschist to amphibolite and partly granulite facies. Bodonch area in southwestern Mongolia contains pelitic schists and amphibolites with various mineral assemblages such as garnet + kyanite + staurolite + biotite + plagioclase, garnet + biotite + staurolite + cordierite, and amphibole + quartz + plagioclase + garnet + ilmenite. We performed detailed petrologic, geothermobarometric and mineral equilibrium modelling studies on the rocks and obtained peak P-T condition of 640-690°C /6.3-10.7 kbar and clockwise path from the area. In this study we performed fluid inclusion study on amphibolite-facies pelitic schists from Bodonch area of western Mongolian Altai. Three categories of fluid inclusions have been observed in quartz: dominant primary and secondary inclusions, and least dominant pseudosecondary inclusions. As quartz in the samples are texturally associated with biotite, kyanite, and staurolite, which were probably formed during peak metamorphism, we regard that the primary fluid inclusions trapped in the quartz grains probably preserve peak metamorphic fluids. The melting temperatures of all the categories of inclusions lie in the narrow range of -57.5 to-56.6°C, close to the triple point of pure CO2. Homogenization of fluids occurs into liquid phase at temperature range between -33.3 to +19.4 °C, which convert into densities in the range of 0.78 to 1.09 g/cm3. The estimated CO2 isochores for primary and pseudosecondary high-density inclusions is widely consistent with the peak metamorphic condition of the studied area (6.3-7.3 kbar at 655°C). The results of this study, together with the primary and pseudosecondary nature of the inclusions, indicate CO2 was the dominant fluid component during the peak amphibolite-facies metamorphism of the study area. Therefore, this is a rare example of amphibolite-facies rocks. The origin of CO2-rich fluid is not known, therefore we expect the common occurrences of carbonates and graphite in the study area suggest the origin of CO2 may have been related to either by oxidation of organic carbon or devolatilization of carbonates in the protolith sedimentary rocks.

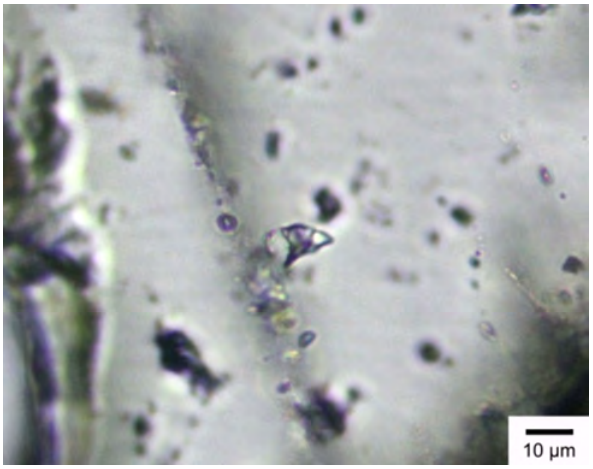

Fig1. Primary fluid inclusions in quartz

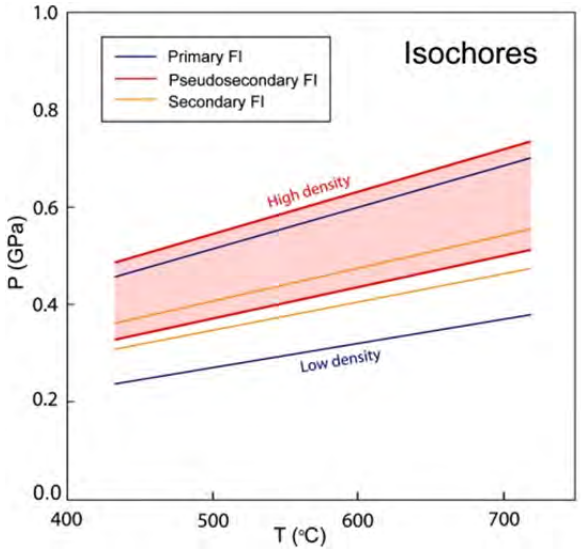

Fig2. Isochores for carbonic fluid inclusions