Mineralogical and geochemical studies of the metasomatic rocks within Gachin, Kalat, Pohl and Hormuz Island salt plugs, Iran

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The Gachin, Kalat, Pohl and Hormuz Island salt domes are located in the Bandar Abbas province. They are a part of the Hormuz formation which situated in the Iran-Pakistan salt basin. The studied area centered at 25 ° 24´-27 ° 08´ N and 53 ° 55´-59 ° 15´ E at the geology map of the area [4]. The studied area is composed of some Infracambrian–Cambrian igneous and evaporites rocks. The igneous rocks composed of mafic to felsic composition and involve basalt, andesite, rhyolite, rhyolitic tuff and some hypabyssal bodies and occur in the within plate continental rift. On the basis of petrographic studies mineral assemblage has formed in magmatic (I) and metasomatic (II) stages. Clinopyroxene, amphibole, biotite, plagioclase, feldspar and quartz is the main magmatic minerals. Tremolite-actinolite, garnet, albite, epidote, sphen have occur in the metasomatic stage. According to the EPM analysis the chemical composition of the pyroxene is salite-frrosalite to augite. The composition of garnet is andradite-grossular ($An_{29.21}$ $Gros_{70.78}$), feldspar is albite ($An_{4.03}$-$Ab_{95.36}$-$Or_{0.60}$), epidote is pistachit. Clinopyroxene thermo-barometers range from 1060≤ T≤1290 °C and 1 ≤ P≤10 kbar [5], also chlorite [3] and plagioclase [2] geothermometer yielded a temperature of 330 °C and 500 °C for them respectively. Fluid inclusion studies have documented vapor bubbles, fluid and solid (cube halite) inclusions in the hydrothermal vein quarts. The salinity of the studied samples is 35-45 wt % NaCl and the homogenization temperature range 205 °C-320 °C. Fluid inclusion data on the salinity-temperature diagram [1] have plotted on the mixing magmatic-meteoric field. On the basis of field, petrography, mineral chemistry, thermo-barometery and fluid inclusion data we could proposed following conclusions:

At first stage, magmatic and evaporate rocks have formed in the within plate continental crust in the striking an aborted rift. At latter stage, meteoric water entering igneous-evaporite assemblage and a hydrothermal system has created so Na, Ca, Fe metasomatism occurred in the system and metasomatic minerals have formed.

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Carbon cycling in the Pliocene Velenje Coal Basin, Slovenia, inferred from stable carbon isotopes

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Introduction

In this study, stable isotopes of carbon were used to trace organic and inorganic carbon cycles and biogeochemical processes, especially methanogenesis within different geological media of the Pliocene lignite-bearing Velenje Basin in northern Slovenia. The study is based on investigations of carbon isotopic composition of the following geological media: 1) lithotypes of lignite, 2) coalbed gasses, 3) calcified woods and carbonate-rich sediments, and 4) groundwaters in various aquifers.

Discussion of Results

For different lignite lithotypes it was found that $\delta^{13}C$ values ranged from -28.1 to -23.0‰, the variability is being a consequence of original isotopic heterogeneity of the source plant ingredients and of biogeochemical processes (gelification, fusinitization, mineralization of organic matter). In the lignite seam the major gas components were found to be CO_2 and CH_4 with small amounts of N_2. The carbon isotope compositions of carbon in CO_2 ($\delta^{13}C_{CO2}$) and CH_4 ($\delta^{13}C_{CH4}$) were very variable and ranged from -9.7 to 0.6‰ and from -70.5 to -34.2‰, respectively. The presence of thermogenic gases is unlikely due to the low rank of the coal and lack of higher chain hydrocarbons. Calcified xylite enriched with ^{13}C ($\delta^{13}C$ values up to 17.1‰) indicated that CO_2 reduction process was present at the time of formation of the basin. The $\delta^{13}C_{DIC}$ values (from -17.4 to -3.2‰) of groundwaters recharging the basin from the Triassic aquifer were consistent with degradation of organic matter and dissolution of dolomite. Groundwaters from the Pliocene sandy and Lithotamnium carbonate aquifers had $\delta^{13}C_{DIC}$ values (from -9.1 to 0.2‰) suggestive of degradation of organic matter and biogenic CO_2 reduction.