

Organic geochemical analysis of hydrocarbon inclusions in quartz from Afghanistan/-Pakistan and Herkimer, NY

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Oil inclusions in quartz from Afghanistan/-Pakistan and solid inclusions from Herkimer, NY were investigated using organic geochemical analysis. The oil quartz analyzed in this study was found near the border of Afghanistan and Pakistan. The occurrence of these quartz cannot be observed because the area is under dispute. On the contrary, the Herkimer Diamond (quartz) Mine can be observed safely; quartz crystals grew in the cavities left after stromatolite dissolved in the dolomite. Quartz crystals were crushed and washed with a DCM solvent. This solution was analyzed in this study. Photoluminescent properties of the extracted samples were examined. Hydrocarbon and PAH fractions separated from the extract by silica-gel column chromatograph and used for this study. Samples from Afghanistan/-Pakistan included a large quantity of n-alkanes, but did not include sterane, triterpane or isoprenoid hydrocarbons. The distribution of n-alkanes was unimodal, with peak for C11 or C13. The carbon preference index (CPI) for n-alkanes was less than 1.0. The individual carbon isotope composition of n-alkanes showed different tendencies in each sample. Small amounts of iso- and anteio-alkanes and alkylcyclohexanes were detected. Alkylbenzenes, particularly ethylbenzenes, were detected in the PAH fraction. Because only a small amount of PAHs was detected, and alkylbenzenes were the only compounds that had fluorescence, the origin of fluorescence for these inclusions was the alkylbenzenes. On the other hand, Herkimer Diamond does not have inclusions exhibiting fluorescence. The inclusions in Herkimer Diamond quartz were solid graphite. Herkimer Diamond quartz was hosted by Paleozoic dolostone; this dolostone was used for organic geochemical analysis in this study. The biomarker compositions extracted from this dolostone were similar to the composition of oil quartz. There was a unimodal distribution of n-alkanes, lack of steranes and hopanes, and the biomarker composition was characterized by alkylbenzenes. Alkylbenzenes are characteristic compounds that are fluorescent in the inclusion in quartz from Afghanistan/-Pakistan and in quartz hosted dolostone from Herkimer. There is a possibility that the environment of alkylbenzene formation is related to the origin of clean, clear quartz crystals.