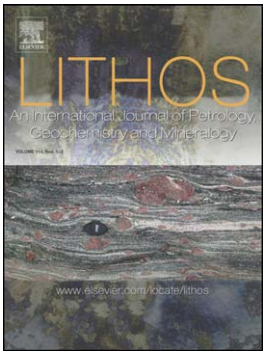

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Moissanite (SiC) with metal-silicide and silicon inclusions from tuff of Israel: Raman spectroscopy and electron microscope studies

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ABSTRACT

Here, we present studies of natural SiC that occurs *in situ* in tuff related to the Miocene alkaline basalt formation deposited in northern part of Israel. Raman spectroscopy, SEM and FIB-assisted TEM studies revealed that SiC is primarily hexagonal polytypes 4H-SiC and 6H-SiC, and that the 4H-SiC polytype is the predominant phase. Both SiC polytypes contain crystalline inclusions of silicon (Si^o) and inclusions of metal-silicide with varying compositions (e.g. $Si_{58}V_{25}Ti_{12}Cr_3Fe_2$, $Si_{41}Fe_{24}Ti_{20}Ni_7V_5Zr_3$, and $Si_{43}Fe_{40}Ni_{17}$). The silicides crystal structure parameters match Si_2TiV_5 (*Pm-3m* space group, cubic), $FeSi_2Ti$ (*Pbam* space group, orthorhombic), and $FeSi_2$ (*Cmca* space group, orthorhombic) respectively. We hypothesize that SiC was formed in a local ultra-reduced environment at respectively shallow depths (60-100 km), through a "desilification" reaction of SiO_2 with highly reducing fluids (H_2O-CH_4–H_2–C_2H_6) arisen from the mantle "hot spot" and passing through alkaline basalt magma reservoir. SiO_2 (melt) interacting with the fluids may originate from the walls of the crustal rocks surrounding