Natural diamond formed by chemical vapour deposition CVD

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More than 20 years ago Russian geologists reported diamond in bedrock in recent lavas from the active Avacha volcano within the Kamchatka Peninsula (Baikov et al., 1995). These diamonds are aggregates of micro- to nanocrystalline diamond a few hundred micrometre in size. In a recent paper these Kamchatka diamonds have been attributed as carbonado-like diamonds (Kaminsky et al., 2016). However, TEM studies on several of the diamond aggregates have demonstrated that these diamonds have been crystallized via gas phase condensation during volcanic activity. The characteristic microstructure of these diamonds, such as extremely dense twinning with partially very high dislocation density and very high porosity between grains suggests a CVD process for diamond formation. The pore space between diamond crystals is filled either with tridymite or amorphous SiO_2 and/or Si and SiC or with W-carbide and B-carbide. W-carbide and B-carbide as well as Si and SiC can easily crystallize in a CVD process, which is well known from the synthesis of these compounds.
These diamond aggregates form together with W-, B- and Si-carbide in local microenvironments by gas phase condensation where the necessary highly reducing conditions are provided.
Such kind of diamonds can be identified and discriminated from other natural diamonds by their unique microstructure and phase composition.

Baikov, A.I., Anikin, L.P., Dunin-Barkovsky, R.L., 1995. Find of carbonado in volcanic rocks of Kamchatka. Doklady Akademii Nauk SSSR 343 (1), 72–74 (in Russian).

Kaminsky, F., Wirth, R., Anikin, L.P., Morales, L., Schreiber, A., (2016) Carbonado-like diamond from the Avacha active volcano in Kamchatka, Russia. Lithos, 265, 222 –236.

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