

The first finding of diamond in sulfides from diamondiferous garnet-clinopyroxene rocks of the Kokchetav massif

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Sulfides are a common accessory mineral in the ultrahigh-pressure metamorphic (UHPM) rocks of the Kokchetav massif [1]. Garnet-clinopyroxene rocks are remarkable due to the best preservation of UHP mineral associations and were investigated in numerous studies, however sulfides received little attention. In these rocks sulfides occur as inclusions in a spinel-clinopyroxene symplectite after garnet, in the rock matrix [2] or in the polyphase inclusion which consists of submicron metal sulfides, phlogopite and irregularly oriented diamond crystals in the garnet porphyroblast [3]. Here we report a first finding of diamonds in sulfide from diamond-bearing garnet-clinopyroxene rock. The octahedral diamond crystal (~30 μm) was identified as inclusion in pyrrhotite from sulfide-rich association containing pyrrhotite, pyrite and chalcopyrite. This finding suggests that sulfides have been formed at peak metamorphic conditions (>4.5 GPa and 1000°C) and not introduced by later hydrothermal alteration. This fact can be supported by the silicate and sulfide inclusions in garnet [2] and very good preservation of UHP minerals in these rocks. Experimental studies demonstrated that diamond could crystallize from sulfide and metal melts [4], however in the Kokchetav samples diamond are rare in sulfide-rich rocks [2]. The findings of diamond crystals close to sulfides might suggest that latter probably play an important role in the crystallization of diamond. The UHP origin of sulfides in the Kokchetav rocks suggests that sulfides could be important hosts for chalcophile and siderophile elements in deeply subducted continental crust.

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