

Mineralogy of suivites from the Popigai impact crater, Russia.

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The Popigai crater, with a diameter \sim 100 km, is located in the northeastern part of the Anabar Shield of the Siberian Platform. It was formed 35.7 Ma ago as a result of large impact event. Suevites and tagamites are the main types of Popigai impactites, and both of them contain diamonds, formed as a result of the solid-phase transition of graphite of target rocks (gneisses) under the impact compression (Masaitis et al., 2013). Generally, suevites have been described from many of the larger impact structures identified on earth. Herein, we provide the results of detailed mineralogical study of ten samples of suevites to evaluate their genesis and find an evidence to shock metamorphic events. In terms of major- and trace-element compositions suivites are identical to tagamites and intracrater gneisses of the Popigai crater (Shchukina et al., 2017) having the typical to continental crust (Rudnick, 1995) RE composition. Compared to the gneisses of the Khapchan Group, that are target rocks (Vishnevsky and Montanari, 1999), suivites are depleted in Al_2O_3 , Na_2O , and slightly enriched in Ni, Cr, and Cu. Suivites are composed by the glass (up to 70 vol.%) of two texture types (fused and diaplectic varieties), and fragments of target rocks and their minerals (up to 25 vol%) with impact event footprints. The fused glass, usually with porous, 'boiled' structure, have a mixed $\text{Qz}+\text{kfs}/\text{Qz}+\text{Pl}/\text{kfs}/\text{plag}$ composition. The pristine (nonrecrystallized) fused glasses are more common than recrystallized, that opposite to tagamites (e.g. Shchukina et al., 2017). The diaplectic glass is presented by maskelenite and lechatelierite, as well as 'after-kfs' and less often 'after-grt' composition. More than 25 varieties of minerals were identified in suivites. The most common are Qz , kfs (Or91-98Ab2-9, Cn67-78Or22-33), plag (Ab33-48An65-43Or9-2) and grt (Alm48-70Spe0-28And0-3Gro1-18Pyr2-40). The accessory minerals are ilm (Cri75-100Gei0-9Pyr0-16Hem0-8), pyroxene (Di0-1Hd0-1En 53-65 Fs34-46; Di59-73Hd19-27En5-8Fs2-4), mica, Zr , Ru , Ap , Mnz , Spn , Py , Po , Pn , Wyr , baddeleyite, scheelite, smythite, britholite, native iron and zhanghengite (CuZn). The minerals contain numerous impurities in their composition, indicating the addition/removal of K, Na, Fe, Si, Mg, Ca, Al, and Ti, i.e metasomatism. An accretionary lapilli (3 -5 vol %) is the typical component of suivites that evidence to their impact cloud formation. Suivites form the crater-fill deposits and are also found in the ejecta blanket. Suivite minerals record shock metamorphic events of different stages, ranging from the linear fractures and planar deformation features (0-2 stages) to transformation into diaplectic (3-4) and fused (4) glasses. The maximum T parameter of impact event could be evidence from the formation of lechatelierite schlierens (>1700). It is worth noting that minerals with no visible traces of shock metamorphism are also common in suivites.

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