Origin of diamonds in ureilites

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Ureilites are the second largest group of achondritic meteorites. We examined diamond in three ureilitic fragments, AhS 209b, AhS 72 and NWA 7983, by scanning electron microscopy, X-ray diffraction, and transmission electron microscopy to shed light on geological processes of its origin.

The studied AhS fragments show a mixture of nanodiamond and nanographite, together with stacking disorder of diamond (earlier recognized as “lonsdaleite”). In contrast in NWA 7983 the simultaneous presence of micro- and nanodiamonds associated with nanographite was observed. Such kind of diamond/graphite textures are consistent with transformation from carbon-bearing precursor materials found in very fast high-pressure/high-temperature experiments like those simulating natural impacts shock events [1,2,3,4,5]. Based on our results, we propose that ureilitic diamonds were more likely formed by shock events through the conversion of precursor carbon compounds and not under high static pressure in a large planetary body [6].

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