A Mineral From Giant Red Suns

Rockhounds know that silicon carbide, or carborundum, makes great grit for polishing rocks. SiC can also be found from time to time in rock shops as beautifully iridescent crystal clusters. All of this material is artificial. SiC does occur rarely as a natural mineral, and it can form under rather astonishing conditions.

Natural SiC is called moissanite after its discoverer. It forms very tiny green to black to bluish hexagonal plates. It is found sparingly in metamorphic rocks in Bulgaria and Russia. It was first found in meteorites. Moissan had a hard time convincing colleagues that he had found a real mineral and not grit that had been introduced into the sample during its cutting and polishing. Eventually his discovery was accepted.

Moissanite is found as microscopic grains in a particular class of meteorites called "carbonaceous chondrites". They formed in the solar nebula about 4.6 billion years ago, at the same time as the sun and planets were forming. Carbonaceous chondrites get their names from the fact that they contain carbon compounds and unusual nodules called chondrules.

Chondrules are made of silicates and seem to have formed by rapid crystallization. They have a low density and contain lots of gases such as water and $C0_2$. The carbonaceous chondrites are referred to as "primitive" because they do not appear to have been changed chemically since they were first formed from the nebula's dust and gases.

Edward Anders of Cal Tech and Ernst Zinner of Washington University recently reviewed information on these meteoric moissanite grains. They noted that the grains showed so much damage from cosmic rays, that they must have been exposed to space for billion years BEFORE being incorporated into meteorites 4.6 billion years ago. Thus the moissanite grains are examples of an exotic set of particles in these meteors that actually PRE-DATE the formation of the solar system.

If there was no earth, sun or solar system, then where did these grains come from? Anders and Zinner speculate that they formed in flares jetting out of stars called red giants. The particular combination of chemicals and temperatures in these flares give conditions just right for the formation of moissanite. The tiny grains then drifted haphazardly through space, until, by chance, they became part of the solar nebula and were involved in its collapse to form the sun, planets and meteors.

So these tiny grains - falling to earth from space, are like bottles washed up on a beach, bearing news of events long ago and far away.
- Dr. Bill Cordua, University of Wisconsin-River Falls

References:

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