

# Relation between carbonaceous matter and olivine in chondrules of the Allende meteorite

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The relation between carbonaceous compounds and olivine at the time of solar system formation is understood by the relation between a reducing agent and an oxidizing agent. On heating at high temperature, when carbonaceous compounds exist more than olivine, a part of carbonaceous compounds evaporate by changing into carbon monoxide, and the nature of the residual carbonaceous matter becomes close to graphite, all the olivine changes to other minerals. On the other hand, when olivine exists more than carbonaceous matter, all of the carbonaceous matter evaporate changing into carbon monoxide, and olivine which was not used for the reaction remains as it is. This reaction occurs at the time of formation of the parent body of carbonaceous meteorites. The trace of that reaction may be left in chondrules of carbonaceous chondrites.

Usually, in the place where the parent body of the carbonaceous chondrites was formed, the amount of carbon is smaller than that of olivine. The carbonaceous matter and olivine are considered to be the mixture of a solid particle before heating to yield chondrules. The mixture is heated at very high temperature in a very short moment. So the reaction proceeded in very heterogeneous manner. Therefore, carbonaceous matter was found at the place where carbon exceeds the quantity of a olivine partially, as shown in previous research.

The author found out that carbon distribution and olivine distribution is overlapping by using images obtained with a laser Raman microscope. It is difficult to interpret this fact by uneven distribution of carbonaceous matter and olivine. In the part where the amount of carbonaceous matter is larger than that of olivine, carbon is detected and olivine is not. Therefore, the distribution of carbonaceous matter and olivine does not overlap each other.

By the way, the authors have found that a reaction proceeds extremely unevenly in the shock experiment of the powder sample of carbonaceous matter (an organic compound is included). In the case of glycine (a kind of amino acid), although graphite is formed at the surface of the particles by high temperature heating, unaltered glycine was found inside of the particle. We interpret the finding by the scenario of chondrule formation due to shock wave.