

Review of recent presolar grain studies

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Presolar grains were first discovered in 1987. Since then studies of presolar grains have become an important field connecting meteorite studies, astrophysics and stellar nuclear physics. Here, recent advances on presolar grains are reviewed.

Because of the small size of presolar grains, sophisticated instruments are employed for their studies.

Transmission electron microscopes (TEM) are frequently used to investigate internal structures of presolar grains. For instance, TiC distribution in a graphite grain was observed by TEM, based on which the growth of graphite was discussed.

Synchrotron X-ray Fluorescence is used to measure chemical compositions of small presolar grains. By comparing abundances of various elements in SiC with solar abundances, condensation of those elements have been investigated.

Resonant ionization mass spectrometry (RIMS) is employed to measure isotopic compositions of trace elements in presolar grains. Ba isotopic compositions in SiC measure by RIMS is shown to agree well with theoretical Ba isotopic composition in AGB stars, whereas Fe isotopic compositions seem not to be explained well with conventional AGB star models.

NanoSIMS is a powerful instrument that can measure isotopic compositions of submicron areas. Recent studies show, e.g. isotopic heterogeneities of C and O isotope in SiC, Ti isotope homogeneity in SiC. Compositions of SiC that was too small to measure previously, have also been reported.

Oxygen isotopic composition in oxide and Si isotopic composition SiC are expected not to be affected by nucleosynthesis in AGB stars, and hence is considered to be determined by galactic chemical evolution (GCE). It seems that checking the validity of the concept of GCE is the important goal of presolar grain studies.