

Micro Laue diffraction study of the grains obtained by the NASA Stardust Mission

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The Comet Wild-II particles collected by the NASA Stardust Mission were analyzed by synchrotron X-ray diffraction method. Diffraction experiment was carried out using the microbeam diffraction system placed at beam line BL-4B1 of PF, KEK. The incident beam is limited to 1.6 micrometer in diameter by a micro-pinhole set just upstream of the sample.

One of the sample (C2054,0,35,4) with about 10 micrometer in size was attached to the end of a thin glass fiber. Laue photograph was successfully taken on an imaging plate by 90 minutes exposure using polychromatic X-ray of synchrotron radiation operated at energy of 2.5 GeV.

All Laue spots are well indexed by three domains of one olivine and two orthopyroxenes. The axial ratio of each domain is refined based on the positions of Laue spots. It is shown that the olivine is conceived to be forsterite according to the Vegard's law. The structure refinement including site occupancies of Mg and Fe of olivine was carried out based on the 168 diffraction intensities of Laue spots. The average value of the refined site occupancies $Fe/(Mg+Fe)$ of two sites of olivine is 0.11, which is compatible with the results obtained from axial ratios. The structure of orthopyroxene was also refined based on the 182 diffraction intensities, and the value of $Fe/(Mg+Fe)$ is also around 0.11. The second orthopyroxene could not be refined because of the small number of observed Laue spots.