Mica-group mineral in Allende CV3 chondrite investigated by synchrotron radiation X-ray diffraction method

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Introduction

It is very useful for identification of fine-grained (several to several tens μm across) minerals to use synchrotron radiation X-ray diffraction method. In the study "2000P011", we tried to identify mainly high-pressure minerals in an H chondrite that experienced shock. We also tried to identify phyllosilicates in a CV and an E chondrites. We successfully identified a mica-group mineral in a barred olivine (BO) chondrule in Allende CV3 chondrite. Phlogopite in Ca- and Al-rich inclusions (CAIs) has been reported already (e. g. [1]). However, this is the first identification of a mica-group mineral from a chondrule in Allende.

Sample and method

A phyllosilicate-rich inclusion in a BO chondrule was removed from a polished thin section of Allende CV3 chondrite by a precision drill. The sample has about 300 μm in diameter with 30 μm in thickness. Figure 1 shows a backscattered electron image of the inclusion investigated. It was attached by glycolphthalate onto a 5 μm-diameter glass fiber. The glass fiber was inserted in a 100 μm-diameter glass capillary and fixed with cyanoacrylate glue. The sample assembly was mounted on a goniometer and exposed to monochromatic X-ray (λ = 1.01 A) for 4 hours to take an oscillation photograph. The wavelength of the X-ray was calibrated by measuring polycrystalline Si powder.

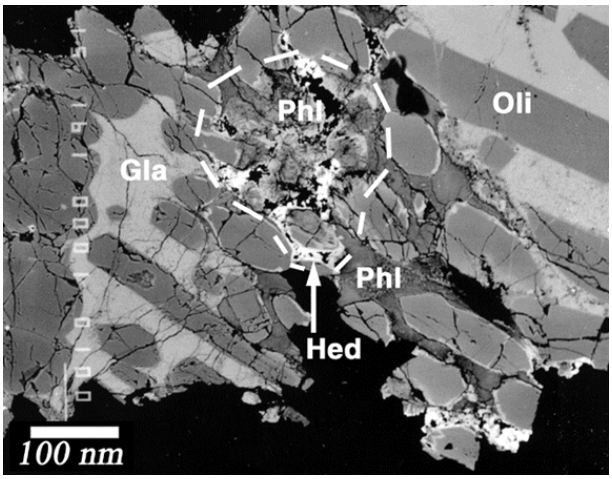

Fig.1 BEI photograph of the phyllosilicate-rich inclusion (enclosed by broken lines) in a BO chondrule in Allende.

Results

Figure 2 is a powder diffraction of the phyllosilicate-rich inclusion. Due to fine-grained and randomly oriented nature of phyllosilicate grains in the sample, well-continued diffraction rings were obtained. Electron microprobe data indicate that the sample contains olivine phenocrysts and hedenbergite as well as phyllosilicates. Therefore, the diffraction rings shown in Fig. 2 are ascribed to these minerals. Diffraction rings indexed in Fig. 2 well coincide with those of phlogopite. Especially, a diffraction ring indexed as (02*l*) has a characteristic feature of a prism diffraction often apparent in the case of phyllosilicates. Microprobe data of the identified mica-group mineral shows that it contains Na as well as K. Because its composition is in an expected immiscibility gap, detailed identification of each ring is needed. Further analysis of Fig. 2 is now in progress.

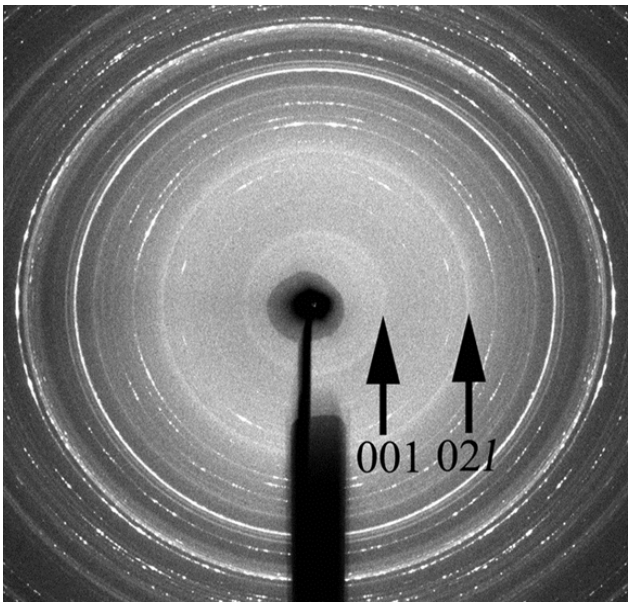

Fig. 2 Diffraction from the phyllosilicate-rich inclusion.

Acknowledgement

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References

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