**CONDENSATION ANISOTROPY OF CORUNDUM IN CIRCUMSTELLAR DISKS.**

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**Introduction:** Equilibrium condensation models predict that corundum ($Al_2O_3$) is one of the first condensates both in protoplanetary disks and around evolved stars, and presolar corundum grains in chondrites [e.g., 1] give a strong evidence of corundum formed by condensation. However, because of the lack of experimental data (e.g., kinetics in condensation), the formation conditions of circumstellar corundum are still poorly constrained. An anisotropic crystal may have a specific morphology depending on the anisotropy in formation processes and conditions, and the morphologies of corundum grains in chondrites and those observed by infrared spectroscopy might contain their formation conditions [e.g., 2]. In this study, we focus on the morphology of corundum and conducted condensation experiments of corundum.

**Experiments:** Condensation experiments were conducted in a vacuum chamber made of stainless steel with a tungsten mesh heater. The chamber was evacuated using a rotary and a turbo molecular pump to high vacuum (~$10^{-4}$ Pa). An alumina pipe (15 mmϕ), put in the chamber as an evaporation source, was heated at 1535°C for 240 hours and was quenched by turning off the heater. Gas evaporated from the pipe condensed on a molybdenum substrate ($20 \times 20$ mm$^2$), which was placed at the top of the pipe. The supersaturation ratio ($S$) of Al-bearing gas species at the surface of the substrate was controlled by changing the gas-source temperature and the position of the substrate.

**Results & Discussion:** EDS analyses showed that all the condensates had the chemical composition of $Al_2O_3$ and EBSD analyses showed that they were corundum (α-alumina). Corundum condensed on the substrate inside the pipe had whisker-like shapes elongating along the c-axis, while hexagonal platy corundum flattened along the c-axis condensed on the substrate outside the pipe. Such a difference in shape of condensates clearly shows the change of anisotropy in corundum condensation on the substrate inside and outside the pipe.

The pressure of gases evaporated from corundum should be higher in the inside of the pipe than the outside because of conductance of the pipe. Therefore, $S$ on the substrate was higher and lower inside and outside of the pipe ($S_{in}$ and $S_{out}$). $S_{in}$ is roughly evaluated to be <100-1000. Theoretical studies of corundum condensation and the analytical study of corundum grains in the chondrite matrix have shown that corundum grains condense and grow at $S$ of 10-100 in the cooling solar nebula [3, 4], which is comparable with the estimated $S_{in}$ in the present study and much lower than those used in previous experiments [e.g., 5]. Thus, the present results can be the analogue of condensation of corundum in protoplanetary disks, and imply that corundum in circumstellar disks have different morphologies depending on the condensation conditions. Difference of dust morphology can be estimated from the observed infrared spectra, and thus, formation conditions of corundum in circumstellar disks can be evaluated by combining experimental results and infrared observations.

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