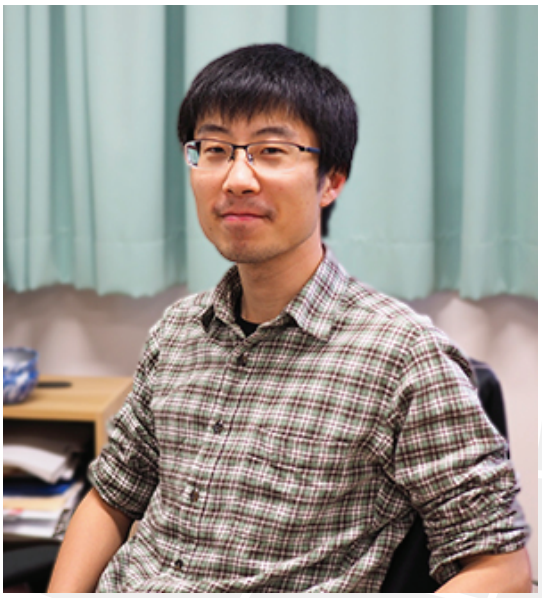

Dr. Youmo Zhou
Post-doctoral fellow
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2020.7.17 (Fri.) 16:30 ~

Venue: Zoom
A link will be sent @grc-all within 30 minutes before the beginning of the seminar.

New high-pressure phases in the Al_2O_3-SiO_2 system: Phase relations and crystal structures

Phase relations and crystallography of the $Al2O_3$-SiO_2 system are important for many disciplines such as Earth and materials science. However, according to previous studies, the mixture of Al_2O_3 corundum and SiO_2 stishovite seems to be thermodynamically stable rather than any aluminum silicates at high pressures (> ~ 12-14 GPa) beyond the pressure stability of Al_2SiO_5 kyanite. Recently we found and synthesized three new phases in the Al_2O_3-SiO_2 system by multi-anvil experiments at pressures of 13-23 GPa and temperatures above ~ 2400 K. According to our results, the decomposition of kyanite into corundum and stishovite occurs at temperatures lower than ~ 2400 K, while at higher temperatures, kyanite transforms into kyanite II at ~14-17 GPa, and kyanite II further transforms into kyanite III above ~17 GPa ; the third new phase, which has a chemical composition of $Al_2Si_2O_7$ and is therefore called 227-phase tentatively, can be formed by the reactions between either of the Al_2SiO_5 phases (kyanite, II, and III) and stishovite. Structural refinement analyses show that these new phases are based on closest but distorted packing of O^{2-}, and the packing of Al-O and Si-O polyhedra is quite crowded for Si^{4+} in comparison with the relatively loose occupation environment for Si^{4+} in well-known silicate structures. The very high temperatures above ~ 2400 K may play a key role in stabilizing the crystal structures of the three new phases at high pressures.

Keywords: New aluminum silicate ; Multi-anvil experiment