Neutron Diffraction Study for Distinct Thermal Behavior of THF Clathrate Hydrate

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To answer the cage dynamics and unique host-guest interacting patterns appearing in the complex clathrate hydrate structures, identification of thermal-structural behaviour occurring between host and guest molecule is required. In this study, we investigated thermal patterns of THF + H_2, D_2, N_2, and O_2 clathrate hydrate by employing high-resolution neutron powder diffraction technique, and suggested the temperature and guest dependant behaviour of clathrate hydrate. In particular, THF + H_2 clathrate hydrate exhibits a 'plastic deformation'-like behavior by introducing thermal history. It was also emphasized that the coherent/incoherent scattering pattern depending on the guest molecule is remarkably influence on the thermal behavior, and it should be considered to understand structural and thermal features through neutron diffraction study.