

# X-ray micro-CT imaging of gas hydrate and ice at lower temperature using synchrotron radiation

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Methane hydrate found beneath the deep sea and in permafrost region is a clathrate hydrate composed of methane and water molecules. Although it dissociates over 193 K, anomalous slow dissociation was observed from 243 K to 268 K, called self preservation of methane hydrate (Yakushev and Istomin, 1992). The details of self preservation were studied by X-ray diffraction (Takeya et al. 2001), Raman (Uchida et al. 2003) and electron spin resonance (Takeya et al. 2004) as well as monitoring amount of methane gas. However, the mechanism of the self preservation has not been clear. For the further discussion about the mechanism, we developed synchrotron radiation X-ray computed tomography (CT) system at lower temperature using gas coolant from liquid nitrogen. The advantages of this system are high resolution (about 1 micron) and quantitative discussion of X-ray attenuation depending on the material by monochromatic X-ray beams. The X-ray CT images of spherical ice, methane hydrate, tetrafluoromethane hydrate and xenon hydrate were obtained. The hydrate, ice and pore were distinguished using the different CT values in xenon hydrate, but the difference of the hydrate and ice was not clear in the other hydrates. In the presentation, the dissociation will be discussed using the 3-D images before and after heating experiments of the samples.