Development of the Cell for Rare Gases Reaction in the Nanoporous Space for XAFS measurement.

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The zeolite provides an ordered matrix that can trap various rare gases such as neon, argon, krypton, and xenon in its void space when the diameter of guest molecules somewhat exceed the window size of the zeolite at room temperature. Among these, xenon and krypton have been extensively utilized as recycle gases from nuclear wastes in nuclear power reactors.

In order to clarify the difference of adsorption of xenon and krypton gases in the zeolite cages, we tried to develop the cell for rare gases reaction in nanoporous space for XAFS measurement. Fig.1 shows the illustration of our developed in-situ cell. The cell is covered with the dry ice in order to prevent from gas diffusion to the air. The cell is always cooled between 250K and 173K in the EXAFS measurement.

As the result, we were able to observe the edge-jump of rare gases in the zeolite cages as shown in Fig.2. In addition, we had two problems, i.e. the leak from the cell/gas-tube connection and the difficult of gases adsorption to the pellet-type zeolites. However, we have already found solutions. The fine structure of rare gases in the zeolite cages would be measured by the improved cell in the next experiment.

Fig.1 illustration of the in-situ cell

Fig.2 EXAFS spectrum for Kr gas in the zeolite cages.