In-situ time resolved XAFS studies on catalysts.

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X-ray absorption fine structure (XAFS) is referred to a modulation in the X-ray absorption coefficient appearing near and above the X-ray absorption edge. It reflects the local (geometric and electronic) structure around the x-ray absorbing atom. Since it does not require the long range order, one can get the information about the highly dispersed species on surfaces. Moreover we can measure the the XAFS spectra at any conditions such as high temperature and high pressure. Synchrotron radiation, which provides a brilliant X-ray, can enables us to carry out \( \mu \)sec ~ msec time resolution measurements. We can carry out in situ time resolved measurements of catalyst materials. I first review our previous in situ time-resolved works.

- One is DXAFS (Dispersive XAFS) studies on the Pt nanoparticle on the MCM-41 during \( \text{H}_2 \) and \( \text{O}_2 \) reactions. The correlation between structure and adsorption was observed.[1]

- The other is the QXAFS (Quick XAFS) measurements of hydrodesulfurization catalysts, \( \text{Ni}_2\text{P} \) under reaction conditions. The reaction mechanism and active site structure were determined by the simultaneous measurements of QXAFS, FT-IR and gas phase analysis[2, 3].

Finally we describe our recent work on XFEL measurements of photocatalyst and its electron transfer processes in SACLA. We will discuss the future direction of XAFS in the application to dynamic studies of chemical processes.

References

