Development of control software for fluorescence XAFS measurement

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We report on the test of linux software for undulator tuning at the beamline BL10XU (1998A0291-NX-np). Owing to the software, undulator gap is controlled to maximize the beam flux during the monochromater scan. This tuning covers a wide energy range (5-30 keV) using first and third order harmonics. The Cr/SiO_2 catalyst was measured for the application of surface structure study.

Impregnated Cr/SiO_2 catalyst has the function of dehydrogenation of ethanol. Cr site before and after ethanol reduction site was measured. The Cr site of Cr/SiO_2 catalyst is believed to be composed of Cr^{3+} and Cr^{6+} ions. To obtain the relationship between structure of catalytic active site and catalytic activity, XAFS spectra is analyzed.

Figure 1 shows an Cr K-edge XANES spectra of Cr/SiO_2 before and after ethanol reduction. For sample before ethanol reduction sample 1s → 3d transition and K absorption edge are observed at 5992.8 eV and 60004.8 eV, respectively. For sample after ethanol reduction, 1s → 3d transition and K absorption edge are observed at 5992.8 eV and 60003.1 eV, respectively. The shapes of 1s → 3d transition shows that Cr site mainly exist as Cr6+ for sample before ethanol reduction and as Cr3+ for sample after ethanol reduction.

Figures 2 and 3 show Cr K-edge EXAFS spectra of Cr/SiO_2 before and after ethanol reduction. Figure 4 showtheir fourier transforms of Cr/SiO_2 catalyst. The two peaks (1.1-1.5Å, 1.5-2.0Å) can be assigned to the Cr=O double bond and the Cr-O single bond. Two peaks ratio changes in Figures 4, in agreement with change of structure of Cr active sites (from chromate to $Cr^{III}{}_2O_3$).

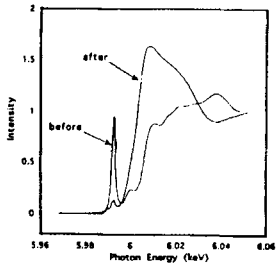

Figure 1. XANES spectra of Cr/SiO_2 before and after ethanol reduction

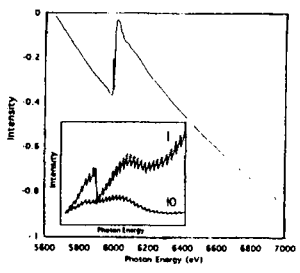

Figure 2. EXAFS spectra of Cr/SiO_2 before ethanol reduction and intensity of I_0 and I

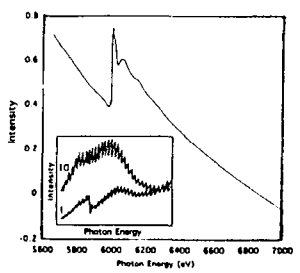

Figure 3. EXAFS spectra of Cr/SiO_2 after ethanol reduction and intensity of I_0 and I

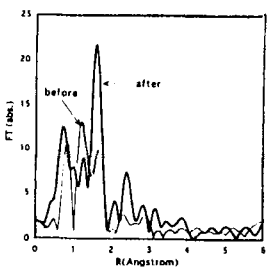

Figure 4. Fourier Transforms of Cr/SiO_2 before and after ethanol reduction