

Title : Preliminary Study for the X-ray Standing Wave Analysis of the Electrode/Zirconia (solid state electrolyte) Interface

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Yttria stabilized zirconia (YSZ), that is ZrO_2 which includes 8-10 mol % of Y_2O_3 , attracts much interest as the solid state electrolyte for electrochemical devices such as oxygen sensors and fuel cells ¹⁾. The properties of these devices are found to be dominated by the metal/YSZ interface structures ²⁾. However, there have been few reports on the structure of this system despite of its importance. So, we have chosen Pt/YSZ system that is one of the most popular specimens because of its high reactivity. As a first step, 1ML of Pt was deposited on clean YSZ surface in UHV chamber. This system is expected to keep an ordered phase even in the air ³⁾.

The X-ray standing wave (XSW) method is known as a powerful technique to investigate the surface or interface structures including the small amount of dopants. However, fluorescence from some impurities in the substrate crystal cover critically up the L fluorescence of a small amount of Pt atoms. Hence, the use of Pt K-edge (78 KeV) excitation allows us to take fluorescent signal with low noise level. It is also a good opportunity for showing a merit of the facility that can provide the high energy incident beam.

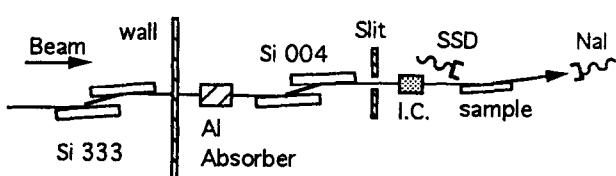


Fig.1 Schematic view of the experimental setup

Schematic view of the experimental setup is shown in Fig.1. The wavelength was fixed at 0.147 Å using Si 333 monochromator for the BL09 undulator fifth harmonic source (Gap=10.66mm). The first order reflection was removed by an Al absorber of 30mm

thick. After Si 004 pre-monochromator in the experimental hutch, beam was introduced on the Pt/YSZ (001) sample. Fluorescence yield was measured by SSD (Ge) detector.

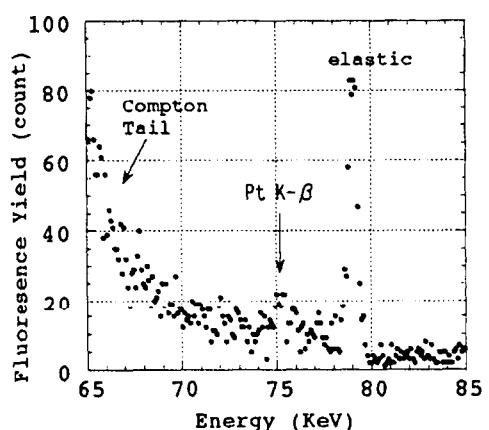


Fig.2 Fluorescence yield from Pt/YSZ sample

Owing to the limited time (9 shift) and an accidental condition of ring (cavity) at last day (4 Nov. 1998), we did not achieve the XSW data. However, since this experiment was the first trial in this field in this energy range, not a few specific cautions were estimated : necessary stability of goniometer, decreasing level of photon density, undesirable satellite reflections, low efficiency of the detectors and derived difficulty of alignment, Compton scattering yield as background level, desirable geometry, etc. Fig.2 shows the Pt fluorescence yield as a basis of the XSW data, with a hopeful result of the next step.

References.

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- 3) S.Roberts et al. : J.Phys.Chem. 95 (1991) 5600.