# X-ray absorption spectroscopy to determine originating depth of electrons that form an inelastic background of Auger electron spectrum

Noritake Isomura[1], Takaaki Murai[2], Hiroshi Oji[3], Yasuji Kimoto[1]

[1]*Toyota Central R&D Laboratories, Inc., 41-1 Yokomichi, Nagakute, Aichi 480-1192, Japan.*
[2]*Aichi Synchrotron Radiation Center, 250-3 Minamiyamaguchi-cho, Seto, Aichi 489-0965, Japan*
[3]*Nagoya University Synchrotron Radiation Research Center, Nagoya 464-8603, Japan*
isomura@mosk.tytlabs.co.jp

X-ray photoelectron spectroscopy (XPS) and Auger electron spectroscopy (AES) are used extensively as research techniques in surface science. In many cases, these techniques suffer from a spectral background covering a wide energy range at kinetic energies below the energy of an elastic peak. The spectral background is mainly due to photoelectrons and Auger electrons that lose some of their initial kinetic energy via inelastic scattering in a sample bulk. Understanding this background is important because it contains information about the sample bulk.

To investigate the spectral components within the AES background for $SiO_2$(19.3 nm)/Si(100) with known layer thickness, X-ray absorption spectroscopy (XAS) was used in partial-electron-yield (PEY) mode at several electron kinetic energies to probe the background of the Si KLL Auger peak [1]. The component fraction (Si and $SiO_2$) derived from PEY-XAS was compared with that obtained from simulations by QUASES [2].

The experiments were conducted at the soft-X-ray absorption spectroscopy beamline BL6N1 of the Aichi Synchrotron Radiation Center. The electron analyzer (PHOIBOS 150, SPECS GmbH) was used as a detector for PEY-XAS measurements.

The PEY-XAS spectra contained the Si and $SiO_2$ components at every kinetic energy. The fractions of these components were obtained by fitting a linear combination of the standard spectra (Si and $SiO_2$ bulk) to the experimental spectra. The AES background for the $SiO_2$(19.3 nm)/Si structure was simulated by the QUASES-Generate program, and the corresponding fractions of the Si and $SiO_2$ components were derived. The fractions obtained from PEY-XAS were consistent with those obtained from the simulated AES background, indicating the validity of measuring the fraction by PEY-XAS. The contributions of Auger electrons originating from layers at different depths to the inelastic background could be thus identified experimentally [3].

The authors are grateful to Yi-Tao Cui of The University of Tokyo for his advices.

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