



Introduction to special issue on X-ray spectromicroscopy

ARTICLE INFO

Keywords

X-ray spectromicroscopy
STXM
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An important area of science covered by the Journal of Electron Spectroscopy and Related Phenomena (JESRP) is X-ray absorption spectroscopy performed with high spatial resolution, often called, **X-ray spectromicroscopy** or **X-ray microspectroscopy**. Over 25 years ago, a special issue of JESRP (Volume 84, 1997) with 19 papers was dedicated to this topic. Over the intervening years the field has expanded considerably, with tremendous improvements in X-ray sources, focusing optics, microscope designs, detectors, techniques and, most importantly, applications to many diverse areas of science, engineering, medicine, etc. This volume, with 30 papers, is an update of the 1997 special issue. It provides an overview of the wide field of X-ray spectromicroscopy, with contributions covering the 5 main methods:

Scanning Transmission X-ray Microscopy (STXM)
X-ray PhotoEmission Electron Microscopy (XPEEM)
Scanning Photoelectron Microscopy (SPEM)
Transmission X-ray Microscopy (TXM) and
Spectro-ptychography

Spectroscopic and imaging capabilities, instrumentation, novel high-impact applications, and future perspectives are presented. The articles summarize recent progress, or report novel results on interesting scientific challenges.

All articles in this special issue are open access for a period of one year (to Aug 01, 2024).

A. Reviews and overviews of facilities

A.1 Ohkochi, et al., Present status and recent progress of research, using photoemission-electron microscopy at SPring-8

A.2 Tolentino, et al., The CARNAÚBA X-ray nanospectroscopy beamline at the Sirius-LNLS synchrotron light source: Developments, commissioning, and first science at the TARUMA station

A.3 Kim et al., Energy material analysis via in-situ/operando

scanning transmission x-ray microscopy: A review

A.4 Amati et al., Scanning photoelectron spectromicroscopy: From static to operando studies of functional materials

A.5 Guttman et al., Nanoscale spectromicroscopy with the full-field X-ray microscope at the BESSY II electron storage ring in the soft and tender X-ray range

A.6 Shiu et al., When microscopy meets soft X-ray at TLS and TPS

A.7 Avila et al., ANTARES: Space-resolved electronic structure

A.8 Feggeler et al., Scanning Transmission X-ray Microscopy at the Advanced Light Source

B. Techniques and Software

B.1 M.A. Marcus, Data analysis in spectroscopic STXM

B.2 A.P. Hitchcock, Analysis of X-ray images and spectra (aXis2000): A toolkit for the analysis of X-ray spectromicroscopy data

B.3 Ryu et al., magnetoARPES: Angle Resolved Photoemission Spectroscopy with magnetic field control

B.4 Stitsky et al., Making chemical sense of phase in soft X-ray spectro-ptychography

B.5 Kolmakov et al., Operando photoelectron spectromicroscopy of nanodevices: Correlating the surface chemistry and transport in SnO₂ nanowire chemiresistors

B.6 T. Ohgashi and N. Kosugi, Developments in sample environment for a scanning transmission X-ray microscope at UVSOR-III synchrotron

B.7 Takeop et al., Development of Soft X-ray Ptychography and Fluorescence Microscopy System using Total-Reflection Wolter Mirror and Application to Measurement of Drug-Treated Mammalian Cells.

C. Applications to materials sciences

C.1 Wenxiong Zhang et al., Visualization of air-induced oxidation in single crystalline 0.6Mn_{0.4}PO₄ nanowires with carbon sheath using soft X-ray spectromicroscopy

<https://doi.org/10.1016/j.elspec.2024.147438>

C.2 Chunyang Zhang et al., Atomically dispersed Ni-N-C electrocatalysts, studied by Ni L-edge spectro-ptychography

C.3 Mariano et al., Scanning transmission X-ray microscopy of hydrogen evolution electrocatalysts on reduction graphene oxide membranes

C.4 Stanescu et al., Scanning transmission X-ray spectromicroscopy: A nanotool to probe hematite nanorods for solar water splitting

C.5 Sun et al., Ionic liquid functionalized tin halide perovskite investigated by STXM and spectro-ptychography

C.6 Jun et al., On the use of soft X-ray STXM for organic-inorganic halide perovskite photovoltaic materials

C.7 Yuan et al., Imaging the complex interactions in CuAg-PEO nanoparticles ensemble for enhanced CO₂ reduction

C.8 Huang et al., Single-atom cobalt-incorporating carbon nitride for photocatalytic solar hydrogen conversion: An X-ray spectromicroscopy study

C.9 Yamaguchi et al., Soft X-ray microspectroscopic imaging studies of exfoliated surface between fluoropolymer and Cu plate directly bonded by plasma irradiation with amino acid

D. Applications to earth and biological sciences

D.1 Rasmussen et al., A library of calcium mineral reference spectra

recorded by parallel imaging using NEXAFS spectromicroscopy

D.2 Everett et al., Illuminating the brain: Revealing brain biochemistry with synchrotron X-ray spectromicroscopy

D.3 Benzerara et al., Quantitative mapping of calcium cell reservoirs in cyanobacteria at the submicrometer scale

D.4 Mansikkala et al., Scanning transmission soft X-ray spectromicroscopy of mouse kidney and liver

D.5 Germer et al., Soft X-ray scanning transmission microscopy as a selective probe of topical dermal drug delivery: The role of petrolatum and occlusion

D.6 Gianoncelli et al., Soft X-ray radiation damage on plunge-frozen and freeze-dried maize roots evaluated by FTIR spectromicroscopy

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