

OKAZAKI CONFERENCE

The 66th Okazaki Conference

Soft X-Ray Raman Spectroscopy and Related Phenomena

(August 17-19, 2006)

Organizers: KOSUGI, Nobuhiro (*IMS*)
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The scope of the workshop was to discuss leading-edge study on resonant and non-resonant X-ray Raman scattering and related phenomena, especially in the soft X-ray domain, covering fundamentals, applications, and technical advances. The participants enthusiastically took part in the discussions through 18 invited talks by leading experts in the field and 11 poster presentations, as well as informal conversations in small groups at the workshop. No timekeepers were assigned for any of the sessions, which helped bring a friendly and relaxed atmosphere into the workshop.

The workshop started on Thursday afternoon (**August 17**) with a brief welcome and introduction by Kosugi (*IMS*), who chaired the first session which was devoted to the fundamental aspects. The first speaker, **Joseph Nordgren** (*Uppsala Univ., Foreign Councilor of IMS*), provided an overview of the history, general concept, and future development of soft x-ray emission spectroscopy. **Shik Shin** (*Univ. Tokyo and RIKEN/SPring-8*) described d-d excitations of the transition metals ranging from oxide compounds to metalloproteins with special emphasis on the ability of soft x-ray emission spectroscopy. **Uwe Bergmann** (*Stanford Univ.*) discussed hard X-ray Raman spectroscopy and its advantage and recent advances in the instrumentations, showing interesting applications to science on water, cold and deuterized water, and transition metal compounds as well as industrial applications to the assessment of crude oil. **Kenji Ohmori** (*IMS*) illustrated the state-of-art control in the attosecond regime and observation of "quantum ripple" of the molecular vibrational wave-packets. This kind of coherent control by using X-ray free-electron lasers will become a great challenge in the near future. Then, a small Get-together Party was held.

The first session in the morning of the second day (**August 18**), focusing on molecular spectroscopy and dynamics, chaired by Takaki Hatsui (*IMS*), started with a talk on the welcoming address and introduction of IMS by Hiroki Nakamura (*Director General of IMS*). As the first scientific talk of the day, **Marc Simon** (*LCP-MR, France*) discussed dynamics during the resonant Raman scattering process near the Cl 1s core of HCl molecules. Simon was followed by a talk on the same topic delivered by **Stephane Carniato** (*LCP-MR*), who illustrated how the vibrationally resolved Resonant Inelastic X-ray Scattering (RIXS) spectra in the tender X-ray region can be described and computed theo-

retically. **Victor Kimberg** (*KTH Stockholm and now IMS*) continued the discussion of RIXS from a theoretical point of view, and presented his recent result on decay dynamics on the soft x-ray emission of LiF and the photoemission of N₂. **Alexander Föhlisch** (*Univ. Hamburg*) reported recent advances of soft x-ray emission spectroscopy in the studies of the adsorbates on silicon as well as heating effect on resonant soft X-ray Raman scattering of silicon. During the two hours kept for lunch, time was used efficiently in which a poster session on several relevant topics was included.

The session on materials science and experimental techniques on Friday afternoon, chaired by Eiji Shigemasa (*IMS*), began with a talk on RIXS studies for nano-structured strongly correlated materials by **Jinghua Guo** (*ALS/LBNL*), who reported an overview of the endstation on Beamline 7.0.1 at ALS and his recent results obtained. **Munetaka Taguchi** (*RIKEN/SPring-8*) discussed theoretical aspects in soft x-ray emission of transition metal compounds. He presented how d-d excitations, charge-Transfer effects and their interplay can be observed in the RIXS spectra. **Hisashi Hayashi** (*Tohoku Univ. and now Japan Women's Univ.*) introduced his lifetime-broadening-suppressed X-ray absorption spectroscopy based on the X-ray Raman scattering process. Successful application of this method to transition metal oxides was reported. After a coffee break, **Takashi Tokushima** (*RIKEN/SPring-8*) started the session on recent instrumentational development, with a talk on the good performance of the varied-line-spacing (VLS) spectrometer installed at SPring-8. He extended his experimental techniques to measure liquid samples and discussed his temperature dependent spectra of liquid water. **Takaki Hatsui** (*IMS*) showed his originally developed transmission-grating spectrometer installed at UVSOR and its performance, as a challenge to achieving higher energy resolution up to $E/\Delta E = 5000$ with increasing throughput in the soft X-ray region. The last talk in the session was given by **Coryn Hague** (*LCP-MR*), who introduced his VLS spectrometer with a premirror, which is to be installed at SOLEIL. He initiated his talk appraising the wine selection for the previous night, on behalf of our French participants. A nice summary of the performances for various spectrometers available so far throughout the world, in comparison to his now-developing one, was presented. After the session, the participants and host enjoyed an informal conference dinner. Close and in-depth discussions were conducted till the late hours of the night.

The session of the final day (**August 19**) was focused on water and related topics, chaired by Okamoto (*IMS*). **Lars G. M. Pettersson** (*Stockholm Univ.*) talked about various kinds of x-ray spectroscopic investigations applied to the study of the liquid water structure. His efforts with collaborators were shown to settle controversial debates from the experimental and theoretical

point of view. **Shinji Saito** (*IMS*) discussed, as one of other techniques to explore water property and structure, two-dimensional Raman spectroscopy from the viewpoint of the theoretical advances. **Susumu Okazaki** (*IMS*) continued the discussion and reported recent theoretical progress on the molecular vibrational relaxation and decoherence of water, deuterized water, and solutions. The last talk was given by **Shaul Mukamel** (*UC Irvine*), who spoke about non-linear spectroscopy and its future possibilities in combination with X-ray free-electron lasers. He succeeded in comprehensible discussion by showing only one viewgraph containing complex equations.