

SIXTH SALVE WORKSHOP

2016



REPORT

The 6th SALVE Summer-Workshop was organized by Prof. Ute Kaiser (Ulm University) and, as pre-vious workshops, held in Hirschegg (Austria) in the Alps, from June 27 to 29th, 2016. The work-shop was a meeting of the members of the Sub-Ångström Low-Voltage Electron Microscopy (SALVE) Project Team of Ulm University (22 participants), of the company Corrected Electron Optical Systems GmbH (CEOS) (4 participants), and of the company FEI Electron Optics (2 partici-pant), as well as guests from Mainz University (1 participant) and the University of Vienna (1 par-ticipant) and from the MPI Garching (1 participant). The program of the workshop included an opening presentation and 15 lectures on various aspects of instrumentation, theory and instru-mentation, on radiation damage and on applications of LV HRTEM, and as usual a mini workshop.

The 6th, SALVE workshop presented our theoretical and experimental evaluation of the operation of the SALVE instrument. We reported about similarities and differences in the operation of the Cs and Cc/Cs corrector systems and summarized that one main difference is just the usage of the TIA software (talk Felix Börnert). We further learnt the basic correction principle of the SALVE corrector (talk Martin Linck) as well as the function of the corrector for EFTEM imaging (talks Frank Kahl, Michael Mohn). Moreover, Peter Tiemeijer reported on the automated fine-tuning of monochromated HR-STEM at low-kV, which currently is in devel-opment. Further we showed first results obtained with the SALVE instrument on imaging single atomic defects and determining the knock-on dam-age threshold of MoS₂ at 30 kV, on the motion of nanostructures inside a single walled carbon nanotube, as well as on the experiments showing charge density wave behaviour in single-layer TMDs. Other techniques which are also relevant for imaging beam-sensitive materials are HRSTEM in UHV (talk Jannik Meyer) and Cryo-FIB-Tomography (talk Miroslava Schaffer) completed the topic.

In the second evening we had a very alive discussion on instrumentation, sample prep and methods for SALVE microscopy also for biological objects. Before the discussion started, Luca Zageri introduced a very good mood by playing pieces from Chopin and Beethoven on the piano.

WORKSHOP PROGRAM

Monday, June 27

- 15:00 - 15:20 Welcome and state of the SALVE Project
- U. A. Kaiser
- 15:20 - 16:00 Differences in operation of Titan and SALVE
- F. Börrnert
- 16:00 - 16:40 Basic correction principles of the SALVE corrector
- M. Linck
- 16:40 - 17:00 Characterization of the SALVE III GIF and first EFTEM experiments with TiO_2
- M. Mohn
- 17:00 - 17:30 Performance of the SALVE III corrector for EFTEM applications
- F. Kahl
- 17:30 - 18:00 Camer evaluation
- L. Zangari
- 19:30 - 20:00 Electron Diffraction of beam-sensitive materials
- T. Gorelik
- 20:00 - 20:30 Contrast in low-kV STEM
- Maarten Bischoff

Tuesday, June 28

- 8:30 - 9:00 Automated fine-tuning of monochromated HR-STEM at low-kV
- P. Tiemeijer

- 9:00 - 9:30 New developments for low-dose imaging and in-situ experiments
- J. Meyer
- 9:30 - 10:00 HRTEM image calculation at low voltages using Python/Phase Contrast in STEM
- M. Linck
- 10:30 - 11:30 Visualizing Cellular Landscapes in Molecular Detail by in Situ Cryo-Electron Tomography
- M. Schaffer
- 12:00 - 18:30 Miniworkshops
- 20:00 After-dinner-evening with piano music performed by Luca and open discussion on specimen requirement

Wednesday, June 29

- 9:00 - 9:30 (S)TEM of biological specimens
- W. Tichelaar
- 9:30 - 10:00 Imaging MoS_2 - monolayers at 30 kV in the SALVE
- T. Lehnert
- 10:00 - 10:30 In-Situ TEM Observation of Motion of Nanostructures Entrapped in Carbon Nanotube
- K. Cao
- 10:30 - 11:00 Experiments on low-dimensional charge density wave materials
- M. Kinyanjui

In Summary, we had again new insights and presentation to all aspects of SALVE microscopy for beam-sensitive low-D materials gained from theoretical and experimental evaluation of the operation of the SALVE instrument. We look forward to the next challenges and perspectives on the road towards practical applications.



Group photo of the 6th SALVE Workshop in Hirschegg, Kleinwalsertal

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Ministry for Science, Research
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WORKSHOP participants

Participants

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Participants

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