ESTEEM3 Workshop

Electron diffraction for solving engineering problems

– Trondheim, Norway, 21-23 June 2022

Computer exercises will be done on your own computers. Remember to bring your laptop! Participants should install the HyperSpy bundle on their own computers before arriving Trondheim! Install instructions will be sent you during this week.

This Slack is made for the workshop: Slack_ESTEEM3_workshop

The lectures and computer exercises will be in R10 in 5th floor in the Natural Science Building (Realfagbygget), Gløshaugen Campus. Coffee, lunch and snack will be in D4-132 in 4th floor.

Those who want coffee in the morning, can come to D4-132 from 08.30 (map at the end).

Program:

For those who have arrived in Trondheim Monday, **we can meet for dinner/drinks** (on own expenses) on **Monday 20. June at 19.00** – at the entrance of the Frati (downtown Trondheim, Kongens gt 20).

Time	Tuesday, 21. June	Wednesday, 22. June	Thursday, 23. June
09.00-10.00	Lecture I: Paul Midgley	Lecture III: Paul Midgley	Lecture V: Tina Bergh*
10.00-10.30	Coffee break/ discussions	Coffee break/ discussions	Coffee break/ discussions*
10.30-11.30	Lecture II: Stefan Zaefferer	Lecture IV: Stefan Zaefferer	Lecture VI: Tina Bergh /Magnus Nord *
11.30-12.00	Discussions	Discussions	Discussions
12.00-13.00	Lunch	Lunch	Lunch
13.00-15.30	Lab I	Lab III	Lab V
15.30-16.00	Coffee /fruit	Coffee /fruit	Coffee /fruit
16.00-18.30	Lab II	Lab IV	Lab VI
19.30		Dinner – Habitat	

*The last day will be a bit different from the two first:
9:00 – 9:45 Lecture V: Tina Bergh
09:45 – 10:00 Coffee break/discussions
10:00 – 10:45 Lecture VI: Tina Bergh
10:45 – 11:00 Coffee break/discussions
11:00 – 11:30 Lecture VII: Magnus Nord

Lectures:

Lecture I	Paul	Introduction to electron diffraction in the (S)TEM
Lecture II	Stefan	Introduction to EBSD and orientation microscopy
Lecture III	Paul	Applications of electron diffraction in the (S)TEM
Lecture IV	Stefan	Applications of EBSD
Lecture V	Tina	Electron diffraction for phase identification
Lecture VI	Tina	Scanning precession electron diffraction for phase mapping
Lecture VII	Magnus	Differential phase contrast

NTNU TEM Gemini Centre esteem3

Labs:

Lab number What Responsible	1 SEM Stefan, Shao-Pu	2 TEM Emil	3 Kikuchipy Håkon	4.5 and 6 Hyperspy/pyxem Magnus, Tina ++
Lab I Tues 13.00- 15.30	Group 1	Group 3	Group 2	Groups 4,5, 6
Lab II Tues 16.00-18.30	Group 3	Group 2	Group 1	Groups 4, 5, 6
Lab III Wed 13.00- 15.30	Group 2	Group 1	Group 3	Groups 4, 5, 6
Lab IV Wed 16.00-18.30	Group 5	Group 4	Group 6	Groups 1, 2,3
Lab V Thurs 13.00- 15.30	Group 4	Group 6	Group 5	Groups 1, 2, 3
Lab IV Thurs 16.00-18.30	Group 6	Group 5	Group 4	Groups 1, 2, 3

Lab 1: SEM lab (Zeiss Ultra), Stefan, Shao-Pu, room Berg, F-360

Multiphase superalloy - EBSD – pattern formation and optimization, data acquisition and data analysis

Lab 2: TEM lab (JEOL 2100F), Emil, room KJ1-U007A

Aluminium alloy – information available in electron diffraction patterns in a TEM using a wide range of experimental setups. Electron diffraction techniques; SAED, CBED, NBD, PED, S(P)ED.

Lab 3: kikuchipy, Håkon, room D4-144

Visualization and (Hough and dictionary) indexing of EBSD patterns from polycrystalline nickel, including verification of indexing results using geometrical simulations.

Lab 4: Hyperspy/pyxem introduction, Magnus, room R10

Introduction to JupyterLab, Hyperspy and pyxem. Handling, visualization and plotting of multidimensional and big data.

Lab 5: Template matching in pyxem, Joseph, Tina, Tor Inge, room R10

Part 1: Orientation mapping of gold nanoparticles, Joseph.

Part 2: Phase mapping of precipitates in an Al-Cu-Li alloy, Tina.

Lab 6: Field mapping in pyxem/ Amorphous materials, Joonatan, Dipanwita, Gregory, room R10

Part 1: Amorphous materials and pair distribution functions, Joonatan.

Part 2: Strain mapping, Dipanwita.

Part 3: Differential phase contrast, Gregory.

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