PHYS-E0526 - Microscopy of Nanomaterials

TEM Independent Laboratory Exercise

(Group of 3)

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Submission Deadline: May 19th, 2023

The main objectives of the training were:

1) Basic understanding of using the TEM, which includes sample preparation, loading the sample, operate the microscope, image acquisition, etc.
2) Hands-on training about the TEM alignments (Gun tilt, Gun Shift, Pivot Points etc)
3) Adjusting the Eucentric height of the specimen.
4) What are the factors and parameters which can influence the image quality.
5) How to acquire the image.

Independent Exercise

Each group has 3 hours to characterize independently one unknown sample of material using FEI Tecnai 12 (120 kV TEM).

Tasks

1) Load your grid on to the holder, Insert the holder in TEM (Remember all the instructions given during training). Then, perform all the microscope alignments presented during training.
2) Perform imagining of the sample in Conventional Bright Field mode; spot size:3, objective aperture 3. Acquire images at three different magnifications (10,000 X, 50,000 X & 100000 X), What can you observe?
3) At any of the magnifications, also acquire underfocussed, focused and overfocussed image, Conclude how you detect it, to understand how to acquire focused image in TEM.
4) Save your respective images in your respective group folder.

Instructions for Report:

- Write in a group (1-2 pages) about the exercise you have performed. Write the name of the group members and state the contribution of each group member (both while performing TEM and writing report).
  (Remember: Please do not copy anything from anywhere, it is strictly unacceptable, write the report in your own words).

- Answer the following questions:

1) Why cold trap is important before starting the TEM (two possible reasons that I stated during the training).

2) Write about the alignments you have performed and what alignments you feel are most important.

3) What are different apertures in TEM and their functions? How you align the Objective aperture before image acquisition?

4) What can you conclude about overfocussed, focused and underfocussed image. How you detect it? (Attach the TEM images and name those as Fig. 1, 2, 3 with figure caption)

5) What can you conclude about your sample when image was taken at three different magnifications? If in case you didn't get the focused image, what was the possible reason behind it? (Attach the TEM images and name those as Fig. 1, 2, 3 with figure caption)