Lab course: Low energy electron microscopy (LEEM)

Do not carry out any action with the LEEM without confirmation by the supervisor!
Vacuum valves are operated by the supervisor only!

1 LEEM setup

The low energy electron microscope used in this lab course is shown schematically in Figure 1.

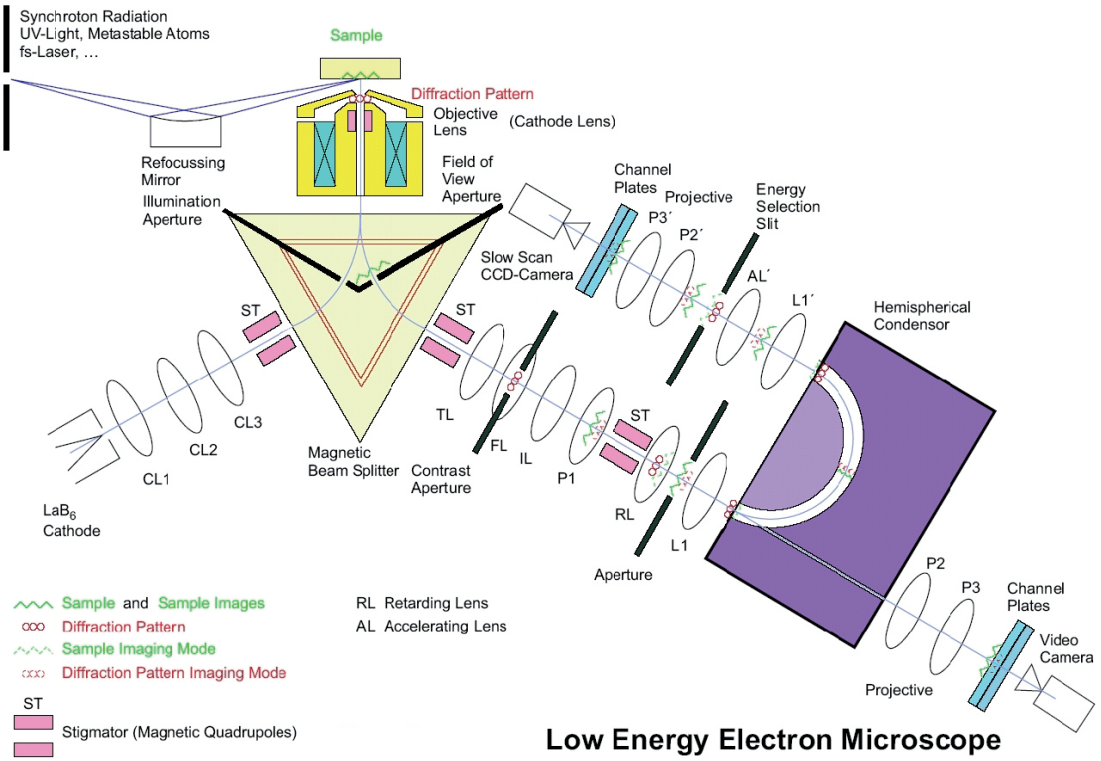

Figure 1: Schematic setup of the LEEM

In addition to electron microscopy, the setup can also be used for low energy electron diffraction at µm-sized regions (=µLEED) and photoemission electron microscopy (=PEEM). In this course you will not use the hemispherical energy analyzer, but operate the microscope in an energy-integrating mode.

2 Materials

You will investigate a monolayer of *para*-sexiphenyl (*p*-6P) molecules adsorbed on a clean Ag(111) surface. The molecules have been thermally evaporated onto the cleaned surface of the silver crystal. The crystal surface was cleaned by argon sputtering and annealing in UHV. Figure 2 shows the arrangement of the top layer Ag atoms of a Ag(111) surface. The structural formula of *p*-6P is shown in Figure 3.

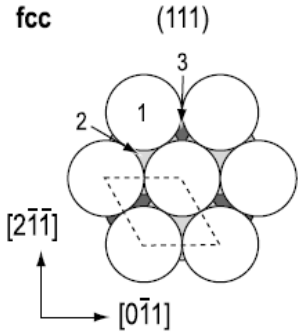

Figure 2: Arrangement of surface atoms of the Ag(111) surface

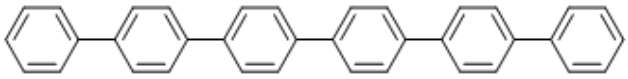

Figure 3: Structural formula of *p*-6P

3 Experimental tasks

1. Confirm that the LEEM instrument is aligned and familiarize yourself with the operation of the instrument.
2. Use the LEEM in bright field mode to visualise the local step structure.
3. Compare the LEED structure from different surface regions utilising differently sized illumination appertures.
4. Record dark field images from the same surface region using different LEED spots.
5. Record the LEED pattern of the same surface area using different electron energies.

4 Data analysis and discussion

1. Which symmetries do the *p*-6P domains have with respect to each other?
2. How are surface steps influencing the shape of domains?
3. Determine the unit cell of the *p*-6P monolayer.
4. Explain why the LEED pattern changes with electron energy.