Nanocalc - Spectroscopic reflectometer

Important notes before measurement

1. Ensure that your material stack could be measured by reflectometric / spectroscopic measurement:

   a. Nanocalc is capable to measure only transparent materials (resists, oxides, thin metals...)

   b. Typically, the surface of the layer needs to have low roughness (polished surface, the layer deposited on a polished surface, *for example – oxide layer on non-polished Si wafer could NOT be measured*)

   c. The reference sample is necessary for the measurement – a sample without examined material stack

   d. The reference sample should be the same thickness as measured sample (small deviation in micrometer range is not typically a problem).

   e. In the reflection mode the sample should have a bulk layer which is not transparent for the wavelengths in the range of 250 nm to 1100 nm

2. Setup your measurement according to your material stack needs:

   a. **Try to avoid using the Deuterium lamp when it is not necessary for the measurement – it has much shorter lifetime than the Halogen lamp and an assembly must be changed as whole.**

   b. Thin layers (to 20 - 30 nm) – switch on the Deuterium lamp

   c. Thick layers (up to 100 μm) – switch on the Deuterium lamp only if you need very precise measurement (resolution down to <1 nm)

This guide obtains just brief information. In case you need detailed instructions, read OceanOptics NanoCalc Software Manual: http://nano.ceitec.cz/equipment-training/ - Reflectometer Ocean Optics *NanoCalc 2000 "Software manual".*

Basic measurement

1. Switch the power button on the Nanocalc box to ON position.

2. Switch on Halogen lamp and wait 20 s before switching on of Deuterium lamp

   a. After 20 sec, switch on the Deuterium lamp, if it would be in use

3. Log in to DEKTAK computer and open the virtualized PC by **Nanocalc-PC 2** on the desktop

4. Run the software NanoCalc (shortcut on the desktop)

5. Click on the button "**load Nanocalc recipe**" and load the recipe (defined by wavelength spectrum range and CH1 means, that only channel 1 is used)

6. Define measured layers stack and substrate (bulk or reference stack) material in "**edit structure**" (material from the database, estimated thickness)

7. Close the shutter on the lamp by setting shutter toggle switch situated on the NanoCalc box to OFF possiton. Measure the dark signal by "**dark**" button in the software window

8. Open the shutter, insert the reference sample under the measuring probe (ensure that light spot is visible) and measure the reference signal by "**Reference**" button in the software (you can tune counts of measurement in continuous mode by the changing of integration time).

9. Insert the measured sample under the measuring probe, measure the signal by "**measure**" button and analyze the thickness by "**analyze**" button (in the software could be also "**measure + analyze**" button combining both functions)

10. Switch off the Deuterium lamp (if it is running), wait 20 sec and switch off the Halogen lamp. For the switching off the whole machine by power button wait at least 5 min. Shut down the Virtual computer as a normal computer with the windows system.