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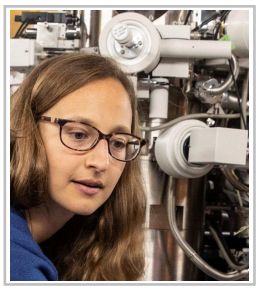
NANOSCALE SCIENCE AND ENGINEERING



MEURET Sophie

Position CR 2

NanoX affiliation CEMES Team I3EM

Host laboratory AMOLF
Science Park 102
The Netherlands

Inviting contact Albert Polman - a.polman@amolf.nl

Dates of stay 16/07/2023 - 16/08/2023

Brief description of the host lab

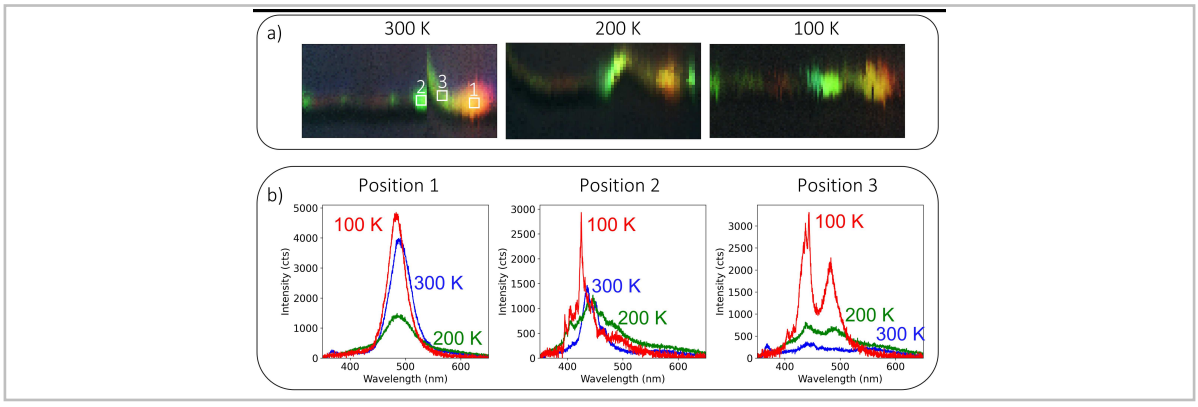
AMOLF researchers study complex matter, such as light at the nanoscale, living matter, designer matter and nanoscale solar cells. These insights open up opportunities to create new functional materials and to find solutions to societal challenges. The institut is divided in three departements, I was hosted in the Photonic Materials group of Albert Polman in the departement of Sustainable Energy Materials. They are among other things specialist in time-resolved cathodoluminescence and developped a unique pump-probe cathodoluminescence experiment.

Research project during the stay

Time-Resolved Cathodoluminescence of GaN based structures

We can now perform time-resolved cathodoluminescence in an ultrafast transmission electron microscope at CEMES. It is one of only two configurations available worldwide. As a result, there is still a lot to learn about the limitations and benefits of this technique in comparison to its much more widely used counterpart: time-resolved cathodoluminescence in a scanning electron microscope. One of the main distinctions between the two techniques is the electron energy (above 100 keV and 30 keV, respectively), which affects not only the resolution but also the number of carriers generated in the materials. One of the first goals of my visit was to compare, using the same sample, the difference and similarity of these two techniques using two types of structures: InGaN/GaN quantum well and GaN Nanolasers. Moreover, the time-resolved set-up at AMOLF is also more versatile, indeed it is easy to study bulk material and change the temperature of the sample. As a result, we use this complementary technique to study our sample as the temperature changes from nitrogen to room temperature. We also study the effect of TEM lamella preparation (Gallium implantation and Strain relaxation) on the carrier dynamics.

If relevant, add a figure



a) False color map of an InGaN/GaN quantum well. Emission between 400 and 550 nm (blue for 400 and red for 550 nm). The maps are of the same area acquired at three different temperatures. b) Spectrum at three different positions shown in the first panel of a). The three spectrum for each panel correspond to the three temperatures studied.