Cathodoluminescence: what we can do with your PV materials (2)

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We will present the basic principles and main specifications of the cathodoluminescence (CL) setup installed at C2N in 2015. It can be used to probe materials with a spatial resolution down to 10nm, over a large temperature range (5K-350K), and the cathodoluminescence (CL) signal can be analyzed over the 250nm-1.7µm spectral range. SEM, CL and EBIC (electron-beam-induced current) maps are recorded simultaneously. Recently, we have also demonstrated CL polarimetry. Moreover, the unique pulsed excitation mode enables time-resolved measurements (TRCL) with a temporal resolution down to 10ps.

For the second year, this (updated) poster is an invitation to discuss on the CL/TRCL capabilities that can help the development of your PV materials and devices.

We will present an overview of our recent achievements:

- Mapping of polycrystalline CdTe thin films on large surface areas:
  - quantitative cathodoluminescence (CL) is used together with numerical simulation to determine grain-boundary, grain-interior, and surface recombination parameters.
  - Room- and low-temperature CL mapping with steady-state and pulsed excitation are used to reveal the defects spatially and spectrally, and lifetime are carried out in single grains.
- Low-temperature CL mapping of GaAsP nanowires provides a way to determine the P content of the ternary alloy in different areas of a single nanowire.
- Quantitative determination of n-type and p-type doping level is demonstrated on Si-doped and Be-doped GaAs nanowires, respectively, by low-temperature and room-temperature CL measurements.
- Large area CL mapping of perovskite layers has revealed localized emission at 500nm, it is attributed to clusters of PbI_2.
- CL polarimetry has been used to distinguish wurtzite and zinc-blende phases in GaAs nanowires. High-resolution CL mapping and time-resolved CL have been used to reveal the properties of GaAs wurtzite (bandgap, defect levels, incorporation of dopants,...).
- TRCL capability has been improved and used to asset the lifetime of carriers in III-V planar layers, GaAs and GaAsP nanowires, CdTe single grains, high-bandgap semiconductors,...

These results have been obtained in the framework of several collaborations and grants that will be acknowledged.