Large size characterization of perovskite materials and modules by wide-field hyperspectral luminescence imaging

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In the context of the research on the up-scaling of the perovskite-based solar cell technology, there is a need in characterizing samples which size can go up to industrial modules (160 x 160 cm² or even 185 x 185 cm²) in order to understand the mechanisms involved in their functioning at these scales which may be different from small laboratory cells. Moreover, it could participate in optimizing the process of large-scale deposition methods by analysing their efficiency and homogeneity. For this purpose, we set up a wide-field hyperspectral photo- and electro- luminescence imaging characterization technique. It allows to determine the photo- or electro- luminescence spectrum at each pixel of the image (see the figure) allowing to analyse material properties all over the entire sample. Its unique in Europe field of view, for this type of instrument, covers up to 185 x 185 cm² and thus is perfectly adapted for the need of large size characterizations. The photoluminescence part allows to perform contactless and non-destructive investigations on full modules but also on materials during the process, which helps to identify the steps to be optimized in order to maximize the module's efficiency. Whereas the electroluminescence part allows to take into account the electrical transport efficiencies. The spectral range covered by the instrument goes from 400 nm to 1600 nm allowing to analyse many kind of materials for solar cells as well as tandems.

The aim of the poster is to present this characterization technique in more details, as well as giving some first analysis results on 5x5cm² perovskite mini-modules for tandem applications.

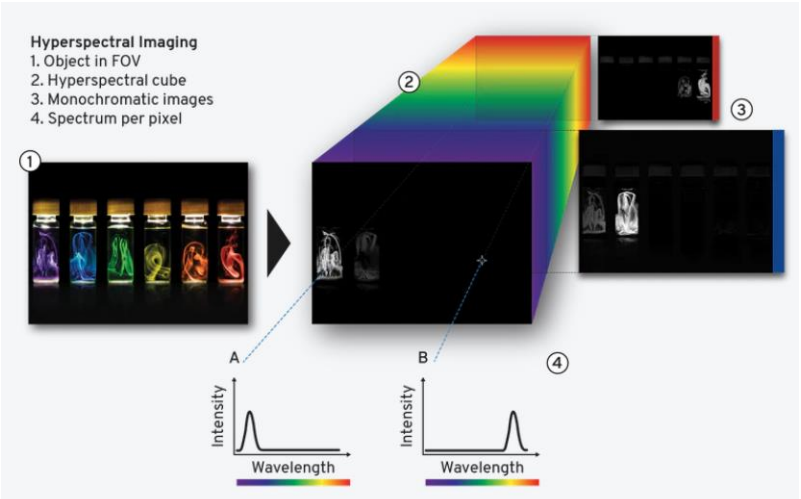

Fig 2. - Schematic of a hyperspectral data cube.