Microwave Microscopy for Advanced and Efficient Materials Analysis and Production

Newsletter #3
October 2019

Word from Gilles Dambrine, project coordinator

We are now at the project mid-term, in line with our objectives. Scanning Microwave Imaging technologies have been augmented (enhanced frequency, resolution and scale) through the development of innovative equipment and modelling techniques, both for Nano and Microscale Imaging.
We note a great dynamism of the materials and devices' manufacturers, which creates a positive driving effect for the project by spreading numerous and diversified materials.

M18 meeting, 15 May 2019, at IEMN, Lille

Dracula Technologies is a French deep-tech startup, which developed an energy harvesting solution called LAYER®. With the spread of the Internet of Things (IoT), new problematics arise for the industry: battery limit, devices lifetime and cost of use related to the time and effort required for the implementation. LAYER® is able to answer these problematics by securing a power source for IoT and Radio-frequency identification (RFID). LAYER® is an organic photovoltaic (OPV) cell, which generates energy from ambient light. The technology is based on a unique manufacturing technique using digital printing. In the same way an office printer uses graphic ink, the company prints its LAYER® modules operating internally formulated functional inks. LAYER® requires specific materials which harvest both natural and artificial light. With inkjet printing, it is possible to produce different shapes and/or specific designs, including curves, and therefore to print LAYER® on flexible supports. To formulate the photoactive inks, only organic materials are used. Last but not least, LAYER® does not require rare earth elements.

Inkjet printer in the Dracula Technologies' LAYER® LINE

Dracula Technologies works on two activities in MMAMA: i) selecting reference photovoltaic materials and structures processed into thin active layers with tailored composition and morphology; ii) using these materials and structures as samples to define measurement protocols and to consider implementing the method as in-line versions in its pilot production line.
The Scanning Microwave Microscopy (SMM) prototype will then be adapted and tested in the LAYER® LINE of Dracula Technologies used for the production of OPV cells and modules. This integration will allow the analysis and the in-line measurement between each step of the full process. This new methodology will be a breakthrough in OPV cells and modules production:

- Live control of layer characteristics;
- Proposal of a flexible and reactive production process.

SMM in-line monitoring is the key success with on-demand production regarding shapes and electrical characteristics.
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LAYER® OPV module by inkjet printing

• Project workshop at EuMW European Microwave Week, Sunday 29 September 2019

MMAMA will present its results during a one day workshop, from the study of electrical properties of organic semiconductors and photovoltaic nanostructures using microwave characterization methods, to the microwave characterization and modelling and the study of frequency range with high sensitivity.

The MMAMA project has received funding from the European Union's Horizon 2020 Research and Innovation program under Grant Agreement N°761036

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MMAMA's related actions with sister projects in the frame of Open Innovation Environment: OYSTER and CORNET

The three NMPB-07-2017 projects share common objectives:
- Characterization of complex materials;
- Advanced modelling approaches;
- Improvement of the production of manufactured products.

Frequent exchanges between them are performed in the frame of the European Materials Characterization Council, EMCC.

One of the common topics is the approach of each project in capitalizing, standardizing, open modelling and data characterizing to a large panel of potential users, through the deployment of Open Innovation Environment (OIE) Platforms:
CORNET: https://www.cornet-project.eu/oie/index.php
MMAMA: https://www.mmama.eu/open-innovation-platform/
OYSTER: http://www.oyster-project.eu/join-oie/

Each project is developing OIEs in a similar way to make better use of their characterization and modelling data, including data reusability, results dissemination and collaboration with other projects and stakeholders.

Recently, a common work from IRES, Brussels; RNANO Lab, Athens; EMCC, Brussels and Università degli studi Roma Tre, Rome led to a new documentation structure for data characterization (CHADA) which has been published in Materials Today Communications (https://doi.org/10.1016/j.mtcomm.2019.100541).
At the initiative of Prof. Marco Sebastiani (OYSTER's project leader), the principle of CHADA and its applicability to several experimental set-ups used in the three projects was discussed during an EMCC meeting.

To register in MMAMA's diffusion list, please contact Jetta Keranen jkeranen@ayming.com

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