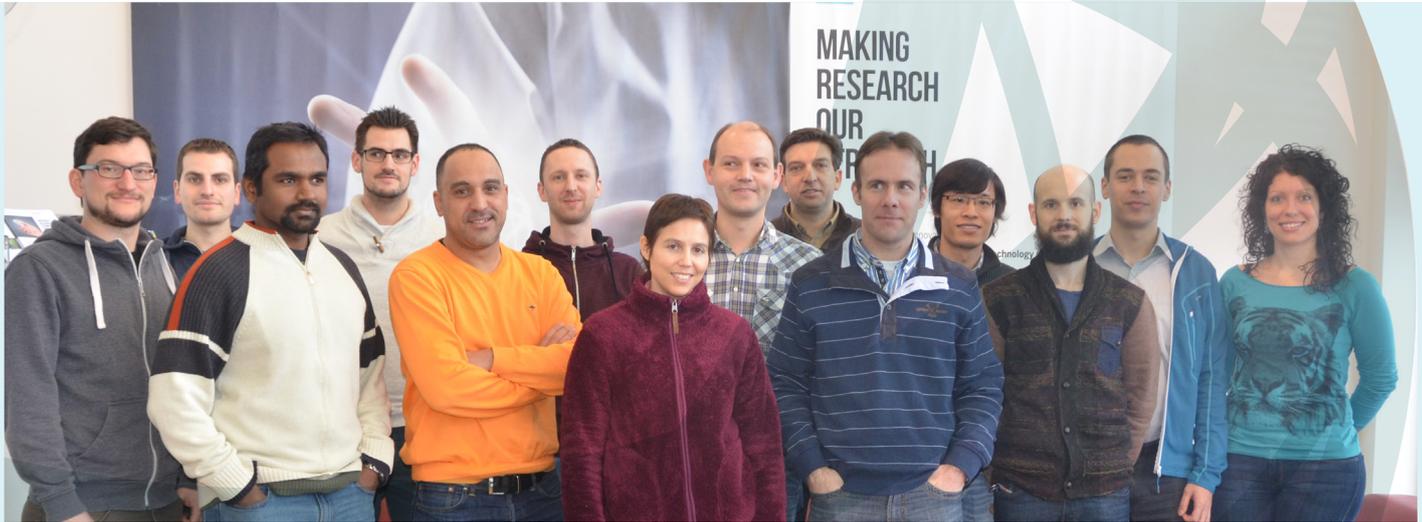


# THE MONTHLY LIST

JANUARY 2017



## UNIQUE MICROSCOPE ALLOWS UNPRECEDENTED INSIGHT INTO NANOSCALE PROPERTIES OF PEROVSKITE SOLAR CELLS

**LIST, in collaboration with the Ecole Polytechnique Fédérale de Lausanne (EPFL) in Switzerland, discovered for the first time the nanoscale elemental distribution of mixed perovskites, which is particularly relevant for the photovoltaic efficiency and reproducibility. The discovery was possible thanks to a unique microscope developed by LIST.**

The HIM-SIMS instrument, which combines a novel high-resolution Helium Ion Microscope (HIM) coupled with a Secondary Ion Mass Spectrometer (SIMS), was developed during the last few years by LIST scientists. The instrument was created by the Advanced Instrumentation for Ion Nano- Analytics (AINA) research group belonging to LIST's Materials Research and Technology (MRT) department within the framework of a major collaboration between LIST and Carl Zeiss.

While the conventional Zeiss Helium Ion Microscope provides morphological images with sub-nm resolution, the unique combination with SIMS allows in addition for high-sensitivity chemical imaging of surfaces with lateral resolution down to 10 nm, a factor of 5 improvement with respect to the best commercially available SIMS instrument. Furthermore, LIST developed correlative methodologies allowing the morphological and chemical data to be combined in a single image.

Joining their forces and using the HIM-SIMS instrument, the scientists from LIST and EPFL were able to make significant progress and to gain unprecedented insights into the nanoscale properties of high-efficiency perovskite solar cells. Perovskite photovoltaics (PVs) appear in the list of the "Top 10 Emerging Technologies of 2016", promising to be a major player in the near future carbon-free energy landscape, an inexpensive alternative to silicon solar panels. Perovskites usually, are deposited as thin films on a surface and self-organize into crystals that can then be used for efficient solar cells, however, limited information is available about their nanoscale distribution of the different elements after the self-organization of the material –which is vital to optimize perovskite photovoltaics.

The results of this study will help to improve the manufacturing of perovskite solar cells in the future and the understanding of the nanoscale perovskite composition. The work was published on November 2016 in the prestigious Journal of the American Chemical Society under the headline of "Intrinsic Halide Segregation at Nanometer Scale Determines the High Efficiency of Mixed Cation/Mixed Halide Perovskite Solar Cells".

Picture from left to right: LIST scientists: Florian Vollnhals, Olivier Bouton, Santhana Eswara, Olivier De Castro, Rachid Barrahma, David Dowsett, Marina Verruno, Tom Wirtz, Jean-Nicolas Audinot, Patrick Philipp, Hung Quang Hoang, Lluís Yedra Cardona, Lukasz Rzeznik, Veneranda Lopez Dias.

# OTHER HIGHLIGHTS



## Luxembourg

### FERNAND REINIG CONFIRMED AT THE HEAD OF LUXEMBOURG'S RESEARCH AND TECHNOLOGY ORGANISATION

At its meeting on the 9th of December, 2016, the Board of Directors of LIST reiterated its confidence given to Fernand Reinig to act as Chief Executive Officer ad interim with all the functions and prerogatives of the CEO at both the strategic and organizational levels. His main task is to stabilize in a sustainable manner LIST and its structures. Once this mission is accomplished, the recruitment of its successor will be initiated. In this way, Fernand Reinig will be able to continue the construction of LIST on strong and solid bases. LIST is and will remain an international Research and Technology Organization (RTO) whose mission is to develop advanced technologies and deliver innovative products and services to the economy as well as to the society. [Learn more on www.list.lu](http://www.list.lu)

## International

### LIST TO HELP WITH PRESERVATION OF THE NATURAL AND CULTURAL HERITAGE IN THE MEDITERRANEAN

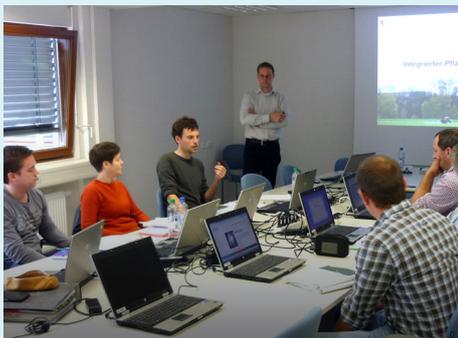
LIST together with the Ministry of Foreign Affairs, formalizes a new cooperation, in the field of sustainable development with DefisMed, a French association working on what they call "a positive tourist transition" committed to the preservation of the Mediterranean natural and cultural heritage. The IT platform, developed by LIST and linked to mobile applications, offering travelers a personalized experience, is entirely suited to the needs of DEFISMED. Both players will collaborate on subjects of common interest, taking advantage of the synergies created by their respective competences. [Learn more on www.list.lu](http://www.list.lu)



## Industry

### LIST ENGAGES IN TRAINING FOR A SAFE USE OF AGROCHEMICALS

Within the now completed Spréztzpass project, funded by the Ministry of Agriculture, Viticulture and Consumer Protection, and at the request from the Agriculture Technical Services Administration, LIST prepared training materials and provided courses to the instructors who will train the Luxembourgish users of agrochemicals according to the EU Directive 2009/128/EC and its transposition into the national law on pharmaceutical products. LIST has not only compiled a training framework for the safe use of pesticides, it also wrote two books describing the framework as well as several PowerPoint presentations that will be used by teachers from the Lycée Technique Agricole in Ettelbrück and the Chamber of Agriculture to train the Luxembourgish pesticide users. [Learn more on www.list.lu](http://www.list.lu)



## Environment

### MALTA SHOWS STRONG INTEREST IN LIST'S DE-WATERING TECHNOLOGIES

Together with the Ministry of Agriculture, Viticulture and Consumer Protection and the Biogas-Vereenegung asbl, LIST recently welcomed a Maltese delegation from the Ministry for Sustainable Development, the Environment and Climate Change. The delegation discovered LIST activities in anaerobic digestion applied to agricultural and municipal wastes, with a particular focus on the Tank-D technology developed in collaboration with Ama Mundu Technologies. Tank-D proposes an innovative way to collect, transport and pre-treat municipal organic waste prior to their valorization in biogas plants under the form of energy and fertilizers. The technology triggered a strong interest from the Maltese Delegation willing to develop and use optimized methods for biodegradable municipal solid waste collection. [Learn more on www.list.lu](http://www.list.lu)



## WHERE TOMORROW BEGINS

Located at the heart of Belval's Research & Innovation Campus, LIST can ideally connect its over 500 specialists in materials, environment and IT, including its more than 70 PhD students, through a broad range of joint projects, programmes and partnerships with virtually all of Luxembourg's other major research players. At Belval, the University of Luxembourg, LIH, LISER, Technoport, Luxinnovation and the Luxembourg National Research Fund are all literally within arm's reach.

**LIST.LU**

Belval Innovation Campus  
Maison de l'Innovation

5, avenue des Hauts-Fourneaux  
L-4362 Esch-sur-Alzette

Tel.: +352 275 8881  
Fax: +352 275 885

Your contact:  
communication@list.lu