Progress in Photovoltaics and Nanotechnology: from FP7 to Horizon 2020

The EU PV Clusters 2nd Workshop and General Assembly

26th – 28th November 2013

Catalonia Institute for Energy Research (IREC)

Venue: Aula Magna, University of Barcelona, Spain

Workshop Report

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SEVENTH FRAMEWORK PROGRAMME

Scale nano

This document is the initial report of the Workshop. It highlights some of the key points against the set objectives. A more detailed and considered report is under preparation.

Introduction

This Workshop was held on 26th - 28th November 2013 at the University of Barcelona, hosted by IREC. It has built on the success of the first Workshop (held at Aix-les Bains, France, in October 2010) to address the following key and ambitious objectives:

- Highlight key results of the projects in the photovoltaics (PV) field in the EU 7th Framework Programme for Research and Technological Development (FP7) and their Technology Readiness Level in a value-chain approach.
- Identify common research and innovation priorities for bridging the gap between nanotechnology-based knowledge produced by those projects and the successful commercialisation of products enabled by these developments.
- Give an updated overview of the portfolio of projects at the final stage of FP7 to bring forward the global picture of PV research and innovation in Europe and highlight the impact of nanotechnology in this area.
- Enable the nanotechnology and PV communities in Europe to consolidate joint collaborations for strategic industrial partnerships and to give key recommendations on future research and innovation needs in the PV domain
- Review the existing nanotechnology and PV roadmaps for the industrial development of PV in Europe, to implement them in Horizon 2020, the EU new Framework Programme for Research and Innovation 2014-2020.

Key Results

The presentations of the projects funded by the European Commission under the FP7 Programme gave a very useful overview of the FP7 projects in PV. The EU PV Clusters gather today about 73 projects (including completed ones). The Workshop gave the opportunity to more than 40 projects and several European initiatives to come together during three full days of constructive interactions.

The presentations highlighted that the European PV research community is at the forefront of global research and innovation activities in all PV technologies. For example, some of the key performance achievements reported were:

- HIPOCIGS exceeded its target of 16% efficiency for CIGS, achieving 18.7%. This has since been extended in the R2RCIGS project to 19.6%
- In SCALENANO 16% has been achieved for electro-deposition CIGS, with its key industrial partner on track for a 2015 market launch
- Over 10% efficiency achieved in an a-Si solar cell in the FAST TRACK project
- The ESCORT project has achieved 13.6% efficiency for porphyrin based cells dye sensitized solar cells
- A 12% efficiency OPV cell has been demonstrated in the X10D project
- 16% efficiency cells have been achieved using lead iodide based perovskite materials
- There have been a number of important achievements in the development of solution and non-vacuum based processes, which will make significant contributions to the development of cost effective PV processing.

Common Research Priorities

Analysis of the presentations highlighted a number of common research priorities. The most common priorities (in no particular order) are:

1. Optimising light capture and management using techniques such as surface texturing and photonic structures
2. Improving TCO and barrier properties
3. Encapsulation process development
4. Understanding behaviour at interfaces and structures and modelling heterostructures
5. Development of new device architectures (e.g. fewer materials layers or the incorporation of nanostructures) to optimise solar cell performance
6. Developing and applying advanced characterisation methods to support performance assessment and quality control
7. Developing standard methods and formal standards to support assessment and quality control
8. High productivity deposition technologies with reliability – especially those that work at atmospheric pressure and at lower temperatures
9. Replacing scarce and toxic materials (e.g. ITO, cadmium, lead) and developing environmentally friendly concepts
10. Scale-up and production – moving from lab-scale to practical production scale
11. Driving towards higher efficiencies, longer lifetimes and lower costs, especially for novel technologies
12. Understanding real user applications and needs and how these can be practically achieved, through engagement with end users.

These common priorities are obviously the key areas for future collaboration. The workshop offered a constructive forum for discussion on these topics.

Key Issues

A number of key issues were highlighted during the Workshop that impact the future strategies for both technology and industry development. These include:

- The challenge of scale-up. Transforming lab-based performance in small samples to large scale is an extremely challenging task, which has often been underestimated. It is essential that ways to address this challenge, to ensure that the globally competitive achievements of the research community are exploited, are identified.
- A reduced emphasis on maximising cell and module efficiency. There is an increasing emphasis in striving to understand specific applications and designing “fit for purpose” PV technologies. Product and building integrated PV offers scope to adopt technologies that offer moderate efficiencies, especially if other functionalities are offered (e.g. transparency). So matching bulk silicon efficiencies is not essential.
- There is a mismatch between the targets of the PV industry and those of key user sectors. For example, the construction sector considers cost per square metre for BIPV – cost per watt is not a parameter of interest. There needs to be more engagement with these end users to begin to “talk the right language”.
- There is the need to continue research at the fundamental level, for consolidation of new and emerging technologies at the nanoscale, as well as to strengthen the establishment

of suitable cooperative actions for advanced training of researchers involving all the actors in PV (universities, industry, research centres).

- The decline in industrial PV manufacturing activity in Europe has become a major concern. It is considered essential that Europe retains this capability and, as a result, a coherent supply chain. Steps must be taken to address this. This was considered by many as the most important issue to address for the European PV industry. It is recognised that it is not an easy issue to address but it needs to be looked at. It was considered that discussion to identify relevant collaborative actions would be required.

Engagement with other organizations and initiatives at European level, including regional initiatives

The Workshop included a very informative session where a number of other European organizations focusing specifically on PV or more generally on energy presented their activities.
An initiative to set up a seven region strategic joint action plan for knowledge-based regional development of PV was also presented (project SOLARROK), which highlights the importance of considering innovative regional research capacities in the policy context.

The session highlighted where each organization was able to support research, innovation and exploitation, using the TRL scale and provided a very constructive forum for discussion. It also highlighted how by working together the organizations could pull together the similarities in strategic research agendas and technology road-maps and thus offer a more persuasive and cohesive contribution to policy makers.

The discussion highlighted a number of opportunities for collaboration between the participating organizations, which was considered a very positive outcome. The opportunities for collaboration include:

- Including outputs of recent EMIRI events on the EU PV Clusters website
- Connect EERA activities with those of the EU PV Clusters
- Promote future KIC InnoEnergy (EIT) calls on the EU PV Clusters website
- Link the EU PV Clusters with future NanoFutures work and events (Nanofutures is already formally linked to EMIRI for nanomaterials)
- Engage with regional SOLARROK activities, potentially involving the EU PV Clusters representatives in regional development groups
- The representatives of the organizations/initiatives were invited to future cluster and sub-cluster events (the next of which is being planned for the Industrial Technologies Conference in Athens in April 2014).

It was further concluded that these initial opportunities for collaboration are likely to be the beginning of further future interactions.

Conclusions

This was a very positive and timely Workshop, at the start of H2020, which addressed all its objectives. Furthermore, it highlighted the strengths of the European PV community and the acknowledged breakthrough potential of nanotechnology for PV, and also the key challenges

for the future if Europe is going to retain its leading R&D position and begin to re-develop its industrial capability.

The Workshop defined a number of common research and innovation priorities and identified key issues that need to be addressed, and started the discussion required to progress these.

It also identified common goals and catalyzed engagement with potential partner organizations, which is likely to be a very constructive step forward in developing the European PV industry.

The *EU PV Clusters* is and remains a very useful initiative and tool to bring forces together and set up strategic partnerships to contribute to this goal.

3th December 2013

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