

# Next-Generation Solar Cells and Conversion of Solar Energy

Because of our concern about global warming and our ever-increasing demand for energy, traditional sources based on fossil fuels must be replaced by clean energy. Renewable energy sources are our future hope; solar energy is a most promising and attractive source to decrease, or even to replace, fossil fuels for future use. To harvest solar energy effectively for electricity, various novel photovoltaic techniques have been developed. The advance of emerging photovoltaic technology is rapid and full of excitement. As a result, the opportunity arose to discuss with some experts working in the research field of photovoltaics during the conference IUPAC-2015 in Pusan, Korea, the possibility to have an international conference on “next-generation solar cells (NGSC) and conversion of solar energy” to be held in Taiwan. Dr. Kathleen Too from the Royal Society of Chemistry (RSC), United Kingdom, supported my idea and then became a co-organizer representing RSC to arrange this symposium together with myself to enable such a wonderful international symposium to take place during November 21–24, 2016 in National Chiao Tung University (NCTU), Hsinchu, Taiwan. This symposium also coincided with the 120th anniversary of NCTU and the 175th anniversary of the RSC.

During this 4 day symposium, we heard 5 plenary lectures, 35 invited talks, and 4 contributed talks, together with many poster presentations focusing on next-generation solar cells, which include dye-sensitized solar cells (DSSC), organic photovoltaics (OPV), quantum dot solar cells (QDSC), perovskite solar cells (PSC), and so on; in particular, perovskite solar cells have attracted enormous attention because of the rapid improvement of their cell performance, which has become comparable with that of commercial silicon solar cells. We were honored to have here the pioneer of next-generation solar cells, Professor Michael Grätzel from EPFL, Switzerland; he delivered the first plenary lecture about the historic progress of the NGSC all the way from DSSCs to PSCs with the certified efficiency of power conversion (PCE) attaining 22%. Many other experts and pioneers (in the picture shown in Figure 1) working in this field also came to Taiwan to explore new techniques on photovoltaics and to share their research ideas and their results of the latest advances in NGSC and the conversion of solar energy. Apart from solar cells, understanding of the basic principles and mechanisms of the conversion of solar energy was the theme of this symposium; for this reason, we had many experts also participating in this conference present their exhilarating results in fundamental research using varied spectral and theoretical methods. We believe that an understanding of the fascinating physical and chemical properties of the new energy materials will offer scientists a marvelous opportunity to work productively in this research field, to solve problems together for tomorrow's sources of clean energy.

As part of this symposium, the program on the second day (November 22, 2016) focused in particular on the celebration

of the 80th birthdays of two Distinguished Professors of NCTU, Prof. Ming Chang Lin and Prof. Sheng Hsien Lin, who have both been key pioneers in fundamental research in the field of the conversion of solar energy. On this occasion, Professor Yuan-Pern Lee, Director of the Center for Interdisciplinary Sciences, NCTU, presented a plenary lecture on highlights of their research and also his research inspired by them. In the search for and development of new solar cells, theoretical and computational approaches are important, to allow for virtual tests and to offer hints and clues for the further design of new materials for NGSC. The pioneering theoretical and computational work of M. C. Lin and S. H. Lin is among such examples; many research activities are focusing in this direction using varied theoretical methods as presented in the second half day of the symposium.

The program on the third and fourth days of the symposium focused mostly on perovskite solar cells; it was not astonishing that we still had many delegates (Figure 2) insisting until the last minute of this symposium to learn the most recent developments of this emerging PV technology. Before the closing of the symposium, six awards on poster presentations were offered by RSC, announced by Dr. Sarah Thomas, Senior Programme Manager, RSC, U.K. I believe that all oral and poster presentations stimulated the exchange of ideas and experience among all delegates of this symposium. I expect also that this meeting will act as a springboard for future activities and that it will help to foster new research collaborations between leading scientists and experts working in this field. Another important point is that this symposium would certainly help in the future development of research on *green* energy in Taiwan.

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Figure 1. Group photo taken at the first day (November 21, 2016) of the symposium. (Photo courtesy of Chih-Kai Lin.)



Figure 2. Group photo taken on the last day (November 24, 2016) of the symposium. (Photo courtesy of Chih-Kai Lin.)

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### Notes

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