# Preface

Extensive use of fossil fuels leads to depletion of natural resources and increases the demand and creates environmental impact. The development of a clean, green and renewable energy carrier that does not utilize fossil fuels is a great scientific and technological challenge. The renewable energy source meets the essential criteria, such as ideally clean, abundant, inexpensive and widely distributed regionally in the world. Converting solar energy directly into electricity as a clean and renewable energy resource is immensely important to solve the energy crisis and environmental pollution problems induced by the consumption of fossil fuels. The groundbreaking report by O'Regan and Gratzel in 1991 on dye-sensitized solar cells with $TiO_2$ film combined with a ruthenium–polypyridine complex dye and the efficiency above 7 % was achieved and following this innovative idea, several dye-sensitized solar cells are developed.

Solar energy conversion based on dye-sensitization of wide band gap nanocrystalline semiconductor film is an area of intense investigation. The most efficient dye-sensitized solar cells (DSSCs) to date are based on ruthenium-containing metallorganic dyes adsorbed on nanocrystalline $TiO_2$, the best of which have been reported to convert solar energy to electrical energy with an efficiency of 10–11%. However, the commercialization of dye-sensitized solar cells is still being delayed due to its relatively lower efficiency. The slow progress in the enhancement in cell efficiency is unable to meet the exponential increase of academic research efforts.

In this Special Volume, with the purpose to influence the progress to achieve higher efficiency in dye-sensitized solar cells. The Volume provides the overview of some recent advances in the dye-sensitized solar cells for solar energy conversion covering a variety of materials development. This volume contains 13 parts and it mainly deals about the development and modification of DSSC components and a few articles reviews the basic principle, operation and progress of dye-sensitized solar cells. The Volume contains forty-one expert contributions from international scientific research community and intended for researchers, scientists, engineers, graduate students and undergraduate students, majoring in electrical engineering, chemical engineering, material science, physics, etc., who are interested in dye-sensitized solar

cells. The editors strongly believe these contributions definitely throw light on dye-sensitized solar cells and contribute to the cutting-edge research. An overview of current directions of thought in curiosity-driven research will provide an essential understanding to young researchers, whose ideas have been represented here.

The editors are grateful to contributors for manuscripts and regret if any copyright is being infringed unknowingly. We acknowledge the sincere efforts of Mr. Thomas Wohlbier, TTP publishing Authority, for bringing the Special Topic Volume in its final shape.

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