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Photovoltaic Technologies, Devices and Systems Based on Inorganic Materials, Small Organic Molecules and Hybrids

EDITORS

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Photovoltaic Technologies, Devices and Systems Based on Inorganic Materials, Small Organic Molecules and Hybrids

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PREFACE

Symposium E, "Photovoltaic Technologies – Materials, Devices and Systems", and Symposium H, "Small Molecule Organic Solar Cells," were held Nov. 25– 30 at the 2012 MRS Fall Meeting in Boston, Massachusetts.

Our energy needs have been forecast to at least double within the next fifty years. Therefore, unless renewable energy can cover the large deficit that fossil fuels can no longer furnish, the stage is set for a major energy shortage. One promising solution is the conversion of solar energy into usable electric power. However, in conventional single-junction solar cells, the maximum efficiency for the conversion of unconcentrated solar radiation is 31%, because a significant part of solar energy is lost due to thermalization of photocarriers, and another part is lost due to poor or no absorption of below band gap photons. To minimize thermalization losses, and to increase the conversion efficiency, it is well understood that the electron energy levels should be adjusted to the incoming photons.

Therefore, this symposium volume is focused on approaches proposed for reaching or exceeding the SQ thermodynamic limit of solar energy conversion. Highlighted are recent advances in some relevant areas of the wide field of photovoltaic technologies such as (1) Silicon and Thin Film Solar Cells, (2) Dye Sensitized Solar Cells, (3) Small Molecule Organic Solar Cells, and (4) High Efficiency Concepts (e.g., MEG, IBSC, multijunction cells, Q-BIC, hot electron cells, photon management and photon recycling etc.). The physics required to approach or exceed the SQ limit, fundamental limitations of solar energy conversion, and some exciting recent development for advanced concepts, e.g., light trapping and spectrum splitting, are introduced.

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