PROCEEDINGS OF SPIE

Solar Hydrogen and Nanotechnology V

Hicham Idriss
Heli Wang
Editors

3–5 August 2010
San Diego, California, United States

Sponsored and Published by
SPIE

Volume 7770

Proceedings of SPIE, 0277-786X, v. 7770

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Author(s), "Title of Paper," in *Solar Hydrogen and Nanotechnology V*, edited by Hicham Idriss, Heli Wang, Proceedings of SPIE Vol. 7770 (SPIE, Bellingham, WA, 2010) Article CID Number.

ISSN 0277-786X
ISBN 9780819482662

Published by
SPIE
P.O. Box 10, Bellingham, Washington 98227-0010 USA
Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445
SPIE.org

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

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Introduction

This special issue is devoted to solar hydrogen production and the associated materials study. It contains 20 research contributions following the conference on Solar Hydrogen and Nanotechnology V that was composed of over 50 oral presentations. We would like to express our sincere thanks for the effort and input that all contributors have made into their presentations and subsequent discussions.

The contributions of this issue extend from polycrystalline to thin film and to single crystal studies by both experimental and computation methods. Most of the subjects dealt with water splitting to hydrogen. For water splitting most of the studies were conducted by photoelectrochemical methods using materials such as $InVO_4$, $ZnO_{1-x}Se_x$, nitrogen doped TiO_2 together with quantum dots (such as CdSe and CdS), GaN thin film, nanostructured MoS_2, InP(100), Ti doped hematite electrodes and nano-$K_4Nb_6O_{17}$ among others. Other work was also devoted to conversion of CO_2 to hydrocarbons and of ethanol to hydrogen. Computation studies based on DFT mainly focused on bang gap engineering and although the method is known to underestimate the materials band gap trends could still be seen and valuable information could be extracted. It was felt that this approach is a more rigorous one compared to combinatorial type of studies for the design and test of new materials.

Needless to say that many challenges are still ahead in order to find a stable and active photocatalytic material for making hydrogen from water. While CO_2 photocatalytic conversion is still in its infancy, this area of research is very attractive, in particular if coupled with water splitting providing the hydrogen to reduce CO_2.

Hicham Idriss
Heli Wang