

edited by

Barry P. Rand | Henning Richter

ORGANIC SOLAR CELLS

Fundamentals, Devices, and Upscaling



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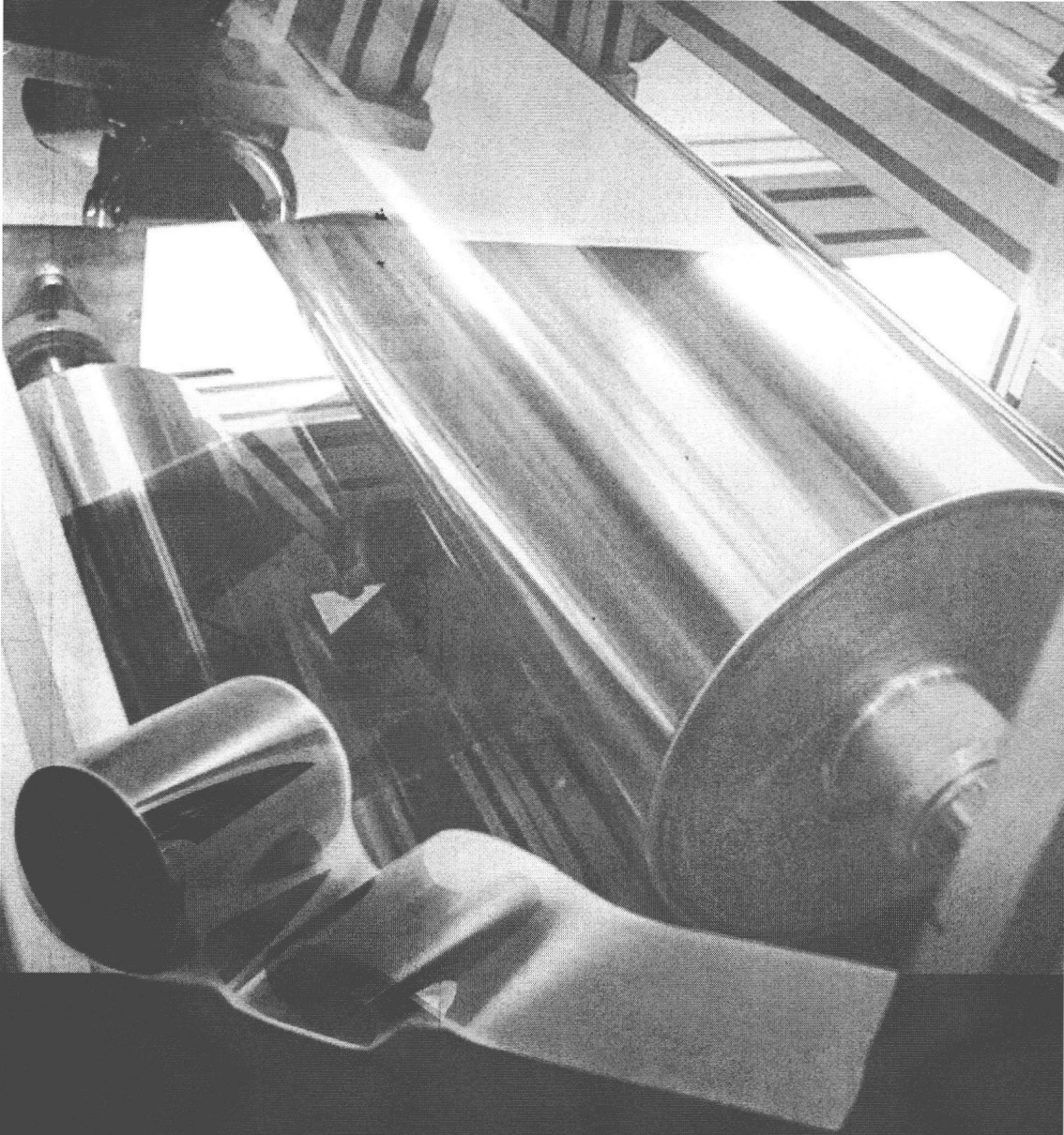
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Preface

When considering how best to present a volume on organic solar cells, we quickly realized the inherent complexity and depth of the topic. On one hand, it is a technology on the verge of commercialization, while on the other hand, there still remain a large range of fundamental and technological questions to be answered. These include a better understanding of the physical processes occurring within and at the interfaces of active and interlayers, device architectures optimized simultaneously for performance and lifetime, and remaining challenges related to large-scale cost-efficient manufacturing. In order to enable industrial implementation of organic photovoltaics (OPV), parallel progress in these and many other pertinent areas is required. To achieve this goal, a close collaboration of scientists and engineers with different backgrounds such as organic and physical chemistry, physics, materials science, and electrical engineering is necessary. Furthermore, it is well accepted that experimental, theoretical, and computational approaches all need to contribute.

With this need for complementary knowledge in different areas in mind, the 15 chapters of this book cover all aspects pertinent for the continued successful development of OPV, including materials design and synthesis, device architecture and characterization, quantum chemical and optical modeling, as well as topics related to roll-to-roll processing, transparent conductors, substrates, module design and fabrication, and finally lifetime and stability. Different, and sometimes even competing approaches, are addressed, such as the use of small molecules compared to polymers as electron donor materials or liquid processing and vapor deposition. We are grateful to the authors from around the world, all leading experts in the areas addressed in the different chapters. While a comprehensive overview is provided, extensive reference sections give the interested scientist the ability to consult the original literature if desired.

The book is intended to be used by advanced undergraduate or graduate students and scientists interested or already working

in OPV. Particularly, we aim to allow for easy access to information complementary to the specific area of the reader but necessary for further progress. For example, organic chemists working on electron-donor or -acceptor materials can gain additional understanding of characteristics needed from a device perspective while physicists developing new device architectures can more easily check the compatibility of new architectures with large-scale manufacturing. As such, with this collected knowledge, we hope that advances may be accelerated such that companies with different focuses and skill sets, ranging from materials suppliers to device manufacturers, can fully develop the value chain of a new emerging industry.

Barry P. Rand
Henning Richter
April 2014

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