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# Advances in Polymer Science

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# **Poly(arylene ethynylene)s**

**From Synthesis to Application**

**Volume Editor: Christoph Weder**

With contributions by

L. Blankenburg · U. H. F. Bunz · E. Klemm · J. S. Moore · T. Pautzsch  
C. R. Ray · T. M. Swager · G. Voskerician · C. Weder · I. Yamaguchi  
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## Preface

Over the past three decades,  $\pi$ -conjugated semi-conducting polymers have attracted significant interest since these materials combine the processability and outstanding mechanical characteristics of polymers with the readily-tailored electrical, optical, and magnetic properties of functional organic molecules. In particular, the potential use of these materials in light-emitting diodes, field-effect transistors, photovoltaic cells, and other opto-electronic devices has motivated the development of synthesis and processing methods of conjugated polymer materials with unique properties. Among a variety of materials, poly(arylene ethynylene) (PAE) derivatives have attracted the attention of an ever growing number of research groups around the globe. Hundreds of different PAEs have been reported to date and, during the last ten years, this family of conjugated polymers has established itself as an important class of materials with interesting optical and electronic properties. The spectacular progress made on many frontiers has propelled PAEs into the scientific mainstream, and many technologically relevant applications that utilize these polymers have been spurred. In six chapters, which root in the authors' own research experience, this special volume of the series *Advances in Polymer Science* attempts to capture the most recent phase of this exciting evolution. The book does not claim to be a complete compilation of the extensive literature in this field, but rather attempts to document recent progress on the basis of selected, illustrative examples. On behalf of all the contributors to this volume, I ask for the understanding of those researchers whose work has not been included.

The first chapter, written by *Uwe Bunz*, summarizes the most recent progress in the synthesis of PAEs and covers the literature from 1999 through 2003. In the second chapter, *Elisabeth Klemm*, *Thomas Pautzsch*, and *Lars Blankenburg* describe current work in the field of organometallic PAEs. The next chapter by *Christian R. Ray* and *Jeffrey S. Moore* focuses on the supra-molecular organization of foldable phenylene ethynylene oligomers and polymers. The application of PAEs in bio- and chemosensors is described in the chapter written by *Juan Zheng* and *Timothy M. Swager*. The penultimate chapter, written by *Takakazu Yamamoto*, *Isao Yamaguchi*, and *Takuma Yasuda*, reviews the synthesis and chemical properties of PAEs based on sulfur-, nitrogen- and silicon-containing heteroaromatic moieties. Finally, a summary of



the electronic properties of PAEs and their potential applications in 'plastic electronic' devices is given in chapter written by *Gabriela Voskerician* and myself.

We hope that this volume will not only become a key reference for those in the field, but also serve its purpose as a source of inspiration for the design of future generations of advanced materials with unique and/or unusual opto-electronic properties.

Shaker Heights, March 2005

Christoph Weder

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