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Principles and Applications of Aggregation-Induced Emission

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Table of contents (21 chapters)

Front Matter

Download chapter PDF

Pages i-xiv

Perarylation as a Strategy Toward Aggregation-Induced Emitters: Will They Ever Be Stable?

Jan Freudenberg, Uwe H. F. Bunz

Pages 1-25

Rational Designs of AIE-Active Molecules and Luminochromic Materials Based on Group 13 Element-Containing Element-Blocks

Kazuo Tanaka, Yoshiki Chujo

Pages 27-42

Precious Metal-Free Organic Small Molecule Luminophores That Exhibit Room Temperature Phosphorescence

Masaki Shimizu

Pages 43-76

Polymers with Aggregation-Induced Emission Characteristics

Jiabao Gu, Anjun Qin, Ben Zhong Tang

Pages 77-108

High Performance Mechanochromic Luminescent Materials from AIEgens

Tianyu Han, Yong Qiang Dong

Pages 109-139

Mechanoluminescence Materials with the Characteristic of Aggregation-Induced Emission (AIE)

Can Wang, Zhen Li

Pages 141-162

Applications of AIE to Molecular Recognition: Why Is It Superior to Unimolecular Recognition?

Takao Noguchi, Daisuke Yoshihara, Seiji Shinkai
Pages 195–221

Tetraphenylethene Derivatives: A Promising Class of AIE Luminogens—Synthesis, Properties, and Applications

Rajesh S. Bhosale, Mahmood Aljabri, Duong Duc La, Sidhanath V. Bhosale, Lathe A. Jones, Sheshanath V. Bhosale
Pages 223–264

AIE-Type Metal Nanoclusters: Synthesis, Luminescence, Fundamentals and Applications

Genji Srinivasulu Yuvasri, Nirmal Goswami, Jianping Xie
Pages 265–289

Nanocrystals with Crystallization-Induced or Enhanced Emission

Wenbo Wu, Udayagiri Vishnu Saran, Bin Liu
Pages 291–306

Fluorescent Aptasensor Based on Aggregation-Induced Emission Probe and Carbon nanomaterials

Lian Ma, Ke Ma, Bin Xu, Wenjing Tian
Pages 307–316

Application of Aggregation-Induced Emission Fluorogens for Detection and Quantification of Toxic Chemicals in Small Aquatic Organisms

Jianguang Qin, Youhong Tang
Pages 317–334

Chapter 9
Tetraphenylethene Derivatives: A Promising Class of AIE Luminogens—Synthesis, Properties, and Applications

Rajesh S. Bhosale, Mahmood Aljabri, Duong Duc La, Sidhanath V. Bhosale, Lathe A. Jones, and Sheshanath V. Bhosale

Abstract To overcome the aggregation-caused quenching (ACQ) effect in the aggregated state new photoluminescent materials are required. Among planar aromatic molecules, naphthalene, anthracene, phenanthrene, fluoranthene, fluorine, pyrene, perylene, carbazole, triphenylamine, fluorescein, phenothiazine, cyanine, diketopyrrolopyrrole, perylene diimide, naphthalene diimide, and porphyrins have all been used for a range of important applications; however, they suffer from the ACQ effect. In 2001, a new phenomenon was described—so called aggregation-induced-emission (AIE), where typically small organic molecules, which are weak emitters when fully dissolved in solvents such as toluene, THF, and chloroform, become highly luminescent in the supramolecular aggregated state, as well as in solid films. Among the AIE-active luminophores developed, tetraphenylethene (TPE) derivatives have attracted significant attention due to their weak intermolecular interactions and excellent solubility in organic solvents, with a structure that is susceptible to functionalization on the planar phenyl groups, which may lead to AIE activity. In this chapter, we described in detail the synthesis, properties, and applications of AIE-active TPE derivatives.

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