SCIENCE CHINA
Chemistry

• EDITORIAL •
September 2013 Vol.56 No.9: 1171–1172
• SPECIAL TOPIC • Aggregated-Induced Emission
doi: 10.1007/s11426-013-4964-z

Preface

Development of new materials with advanced functionality is a crucial step for future technological innovations. Currently, there is a great demand for more efficient luminescent materials, particularly in the areas of electroluminescence, chemosensor and biotechnology. To respond to this demand, scientists have synthesized a large number of luminescent molecules. Whereas many conventional luminophores are highly emissive in dilute solutions, they become weakly luminescent or non-emissive when aggregated. This luminescence quenching effect has frequently been referred to as aggregation-caused quenching (ACQ). The notorious ACQ problem has prevented many lead luminogens identified by the laboratory solution-screening process from finding real-world applications in an engineering robust form.

In the 1950s, Förster observed that fluorescence of pyrene was weakened with an increase in its solution concentration. It was soon recognized that this was a general phenomenon for many aromatic compounds. This concentration-quenching effect was rationalized to be associated with the formation of sandwich-shaped excimers and exciplexes, which "are now known to be common to most aromatic hydrocarbons and their derivatives", as summarized by J. B. Birks in his classical book on *Photophysics of Aromatic Molecules*. Although a variety of chemical, physical and engineering approaches have been taken to interfere with luminophore aggregation, the attempts have met with only limited success. The difficulty lies in the fact that the aggregate formation is an intrinsic natural process when luminogenic molecules are located in close vicinity in the condensed phase.

It will be great, if a system can be developed, in which light emission is enhanced, rather than quenched, by aggregate formation. This will make life much easier as the aggregation now works to our benefit: no frustrating work will need to be done to artificially interrupt the very natural process of luminophore aggregation. In 2001, a Chinese research team led by B. Z. Tang discovered an uncommon luminogen system, in which chromophore aggregation worked constructively, rather than destructively as in conventional systems. They found that a series of silole derivatives were practically non-emissive in dilute solutions but became highly luminescent when their molecules were aggregated in concentrated solutions or cast into solid films. Tang coined a term of "aggregation-induced emission" (AIE) to describe this extraordinary photophysical phenomenon.

Attracted by the fascinating vistas of the AIE phenomenon, many research groups have worked on the design and synthesis of new AIE luminogens, fabrication and modulation of their aggregate morphologies, and investigation and manipulation of their luminescence behaviors. Much advance has been made in the past decade. In this Special Topic, we have invited a group of active AIE researchers to report their latest progresses in the area of AIE research. The authors have developed new AIE systems and discussed the working mechanisms and operating principles of the AIE processes, in an effort to extract information on the structure-property relationships and derive structural design strategies for further creating even newer AIE systems. They have also recapped the research efforts directed towards the exploration of technological, especially optoelectronic and biological, applications of the AIE luminogens through judicious utilization of the AIE effect.

We would like to express our deep appreciation to Editors Dr. Xiaowen Zhu and Dr. Xuemei Zhang for their outstanding work in planning, organizing and editing of this Special Issue, without which the papers could have not been published in such a timely manner. We would also like to thank all the authors who have contributed to this issue. We sincerely hope that the publication of this Special Topic will serve as an inspiration to motivate continuing research effort in the area of AIE study. We greatly appreciate any comments or suggestions from our readers.

DONG YuPing (Beijing Institute of Technology)
TANG Ben Zhong (The Hong Kong University of Science & Technology)
August 1, 2013

DONG YuPing received his Ph.D. degree from Zhejiang University in 1992 and conducted his postdoctoral research work at Peking University in 1992–1994. In 1994 he joined Beijing Institute of Technology as an Associate Professor and became a Professor in 2001. In 1999 and 2003, he worked as a Visiting Scholar in Prof. Ben Zhong Tang's group at The Hong Kong University of Science & Technology. His research interests include the synthesis of novel conjugated polymers and the exploration of technological applications of organic luminogens with AIE characteristics.

TANG Ben Zhong received his Ph.D. degree from Kyoto University in 1988. He conducted his postdoctoral work at University of Toronto. He joined The HongKong University of Science & Technology in 1994 as a Lecturer and was promoted to Chair Professor in 2008. He is interested in the creation of new molecules with novel structures and unique properties. He received a Natural Science Award from Chinese government in 2007 and was elected as a Member of the Chinese Academy of Sciences in 2009. He is now serving as Associate Editor of *Prog. Chem.* and *Polym. Chem.* published by the Chinese Academy of Sciences and the Royal Society of Chemistry, respectively.