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Editorial: Micro-nano optics and photocatalysis materials, devices, and applications

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Editorial on the Research Topic
Micro-nano optics and photocatalysis materials, devices, and applications

Nowadays, the environmental pollution is becoming more and more serious in the world. Micro-nano optics and photocatalysis technology has demonstrated excellent ability in solving this problem. In the process of solving this critical problem, many new technologies have emerged and can be applied to optical communication, information storage, biological transport, drug carrier, sensing, display, luminescence, electronics and other fields. To effectively utilize sunlight, many novel techniques have been developed to synthesize photocatalysts or construct multiple heterojunction composite photocatalysts, and many related emerging technologies have also emerged. The vigorous development of these technologies is conducive to promoting the rapid take-off of the global economy and providing strong technical guarantee for solving environmental problems.

This volume deals with an absorbers for photon detection, optical filtering and spectral sensing, Hall thrusters for aerospace and deep space exploration, photocatalysts for orthopedic implants, photocatalysts for hydrogen production from water decomposition, and special synthesis of special heterojunction photocatalysts. From simulation calculation to experimental research, this study provides an in-depth insight into the core technologies used in optics, aerospace, photocatalysis and medical fields, and points out the direction for subsequent research. Simultaneously, some synthesis methods of novel photocatalysts are also explored, which provides a technical route for constructing new heterojunction photocatalysts.

To effectively use solar energy, (Xu et al.) proposed a design method of asymmetric silicon grating absorbers based on surface plasmon resonance and Fabry-Perot (FP) cavity and used finite difference time domain (FDTD) to simulate the calculation. The influences of geometric parameters, incident and polarization angles on the performance of silicon grating absorbers were discussed in detail. The designed absorber can be potentially used in the field of photon detection, optical filtering and spectral sensing. To achieve solar energy collection, light heat conversion, high sensitive sensing and other functions,

(Huang et al.) designed an ultra-broadband solar absorber on the basis of metal tungsten and semiconductor GaAs structure. By adjusting the geometric parameters, the high efficiency surface plasmon resonance is excited and the ultra-wideband absorption of up to 2,350 nm is realized. Similarly, (Liu et al.) proposed a perfect broadband solar absorber with the structure of GaAs grating-GaAs film-W substrate. The model have been simulated by the finite time domain difference method (FDTD). This structure is thought to be very simple and easy to operate, and can be used in photothermal conversion, collection and utilization of solar energy.

In the past, deep space exploration mainly carried chemical propellant to provide energy for spacecraft, while Hall thruster has gradually replaced the traditional chemical thruster to provide a new technological replacement for the space field. The design of the new Hall thruster has become an indispensable trend to help the new development of space industry. (Yang et al.) designed a new 5 kW Hall thruster, which can be used for deep space exploration, this technology providing reference for the design of Hall thrusters in space industry.

Photocatalytic technology is a green technology which has been developed as the environment is polluted and highly valued all over the world. (Han et al.) reviewed the application of MAl_2O_4 (M = Mg, Sr, Ba) based photocatalysts in the field of photocatalysis, and summarized the development trend of this kind of catalyst in the future, which can be applied to the synthesis and application of other photocatalysts. Photocatalysts can be used in medicine, especially orthopedic implants, in addition to efficiently degrading dyes, drugs and hard-to-degrade pollutants in the process of efficient utilization of sunlight. (Qi et al.) studied the application of different types of TiO_2-based photocatalysts in the field of photocatalysis and orthopedic implants based on the preparation of TiO_2-based photocatalysts. These technologies provide technical support for the study of other semiconductor based photocatalysts for orthopedic implants. (Tong et al.) constructed $ZnFe_2O_4$ based heterojunction photocatalyst by sol-gel method, which showed high photocatalytic activity in photocatalytic degradation of dyes, refractory pollutants and drugs. (Pu et al.; Wang et al.; Zhang et al.) and his research group synthesized a variety of semiconductor composites using special preparation methods and investigated their photocatalytic activities of water decomposition to produce hydrogen and dye degradation. The application of these techniques in the field of photocatalysis will promote the further development of photocatalysis.

Author contributions

SW performed the paper writing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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