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Graphical abstracts

PREFACE

An overview of photocatalytic materials
Shaohua Shen, Coleman Kronawitter, George Kiriakidis

Photocatalytic materials for degradation of organics and dyes, antibacterial action, and fuel generation through water splitting and carbon dioxide reduction.

REVIEW ARTICLE

Modified TiO₂ based photocatalysts for improved air and health quality
Vassilios Binas, Danae Venieri, Dimitrios Kotzias and George Kiriakidis

- The air and health quality in various environmental compartments may be improved by photocatalysis with modified TiO₂.
- Coatings with modified TiO₂ have been successfully applied for contaminants elimination under indoor light illumination.
- Modified TiO₂ based photocatalytic processes are promising and effective biocidal techniques for disinfection purposes.
- Determination and toxicity evaluation of the formed by-products is required for further application of these processes.

REVIEW ARTICLE

A review on the effects of TiO₂ surface point defects on CO₂ photoreduction with H₂O
Huilei Zhao, Fuping Pan, Ying Li

- Point defects, mainly oxygen vacancies and dopants in TiO₂ are reviewed on their effects on CO₂ photoreduction with H₂O.
- Diverse characterization methods are available to investigate the type and nature of point defects.
- Point defects can affect TiO₂ properties including adsorption ability, electronic band structures, and charge transfer.
- Photocatalytic performance for CO₂ photoreduction is correlated with various types of defective TiO₂ materials.
- Recommendations for future research on defective TiO₂ are provided.
**REVIEW ARTICLE**

Recent advancements in plasmon-enhanced visible light-driven water splitting
Qingzhe Zhan, Deepak Thrithamarassery Gangadharan, Yanlong Liu, Zhenhe Xu, Mohamed Chaker, Dongling Ma

- The most recently advancements in visible light-driven plasmon-enhanced water splitting were reviewed according to different enhancement mechanisms.
- The influencing factors, such as shape, size and geometric position of metallic nanostructures, in plasmonic-metal/semiconductor system were also discussed in detail.

**ORIGINAL ARTICLE**

Reduced graphene oxide is not a universal promoter for photocatalytic activities of TiO$_2$
Hui Ling Tan, Frans Denny, Mandalena Hermawan, Roong Jien Wong, Rose Amal, Yun Hau Ng

- Photocatalytic activities of TiO$_2$, in general, can be enhanced by the addition of graphene. However, there are many factors that govern the overall photocatalytic activities when graphene is present.
- It is found that the photooxidation of organics is determined by the type and number of functional groups of the organics.
- Interestingly, enhanced photocatalytic activities are not guaranteed.

**ORIGINAL ARTICLE**

Ni(dmgH)$_2$ complex coupled with metal-organic frameworks MIL-101(Cr) for photocatalytic H$_2$ evolution under visible light irradiation
Rong Wang, Li Wu, Bryant Chica, Lina Gu, Gengsheng Xu, Yupeng Yuan

- Photocatalytic activities of TiO$_2$, in general, can be enhanced by the addition of graphene. However, there are many factors that govern the overall photocatalytic activities when graphene is present.
- It is found that the photooxidation of organics is determined by the type and number of functional groups of the organics. Interestingly, enhanced photocatalytic activities are not guaranteed.
### Assembly-Promoted Photocatalysis: Three-dimensional Assembly of CdS$_{x}$Se$_{1-x}$ (x = 0–1) Quantum Dots into Nanospheres with Enhanced Photocatalytic Performance

Lina Wang, Qiumei Di, Mingming Sun, Jia Liu, Chuanbao Cao, Jiajia Liu, Meng Xu, Jiatao Zhang

- CdS$_{x}$Se$_{1-x}$ assembled nanospheres were fabricated from CdS$_{x}$Se$_{1-x}$ quantum dots.
- The assembled nanospheres resulted in enhanced light harvesting.
- The assembled nanospheres facilitated the photoinduced electron-hole separation.
- The assembled nanospheres improved the performance in photocatalytic hydrogen evolution.

### Computational investigation of the co-doping effect of sulphur and nitrogen on the electronics of CsTaWO$_6$

Liuxie Liu, Laicai Li, Quan Li, Chenghua Sun

- The synergetic effect by S/N co-dopants has been investigated for CsTaWO$_6$.
- S/N co-dopants prefer to be separated from each other, and they dominate the edges of conduction band and valence band, respectively.
- Separated S/N co-dopants are beneficial for the separation of photo-induced charges, which is the key reason why S/N co-doped CsTaWO$_6$ offers high performance in water-splitting.

### High Performance Flexible Metal oxide/Silver Nanowire Based Transparent Conductive Films by A Scalable Lamination-Assisted Solution Method

Hua Yu, Andrew Stapleton, David Lewis, Lianzhou Wang

- Using a simple spin-coating and lamination assisted planarization fabrication method.
- A full solution-based approach allows preparation of AgNW-based flexible composite electrodes at temperatures as low as 140 °C.
- The resulting AgNW-based electrodes exhibit higher transmittance on flexible substrate (82% at 550 nm) and lower sheet resistance (12-15 Ω$^{-1}$).
- The lamination assisted full solution-processed method is cost-effective and scalable, which is favorable for the transparent and conductive technique.