Modification strategies of TiO_2 photocatalyst coatings

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In recent years, TiO_2 photocatalysis has received much research interest owing to its potential applications in the field of environmental remediation. However, the large band gap of TiO_2 and fast recombination of photogenerated charge carriers limit its overall photocatalytic efficiency [1]. The large band gap of TiO_2 can be narrowed by modifying the electronic band structure, such as doping elements, forming oxygen vacancy [2]. The fast recombination can be corrected by changing the effect of charge transfer, including the addition of suitable electron acceptors, heterojunction, Z-scheme [3].

This review is to mainly summary the principal results of modification strategies on the TiO_2 photocatalyst coatings formed on Al_2O_3 ball by mechanical coating technique. We have attempted various modification strategies, encompassing the increased surface accessible area, narrowed band gap and effect of charge transfer. By grouping the modification steps of porous structure and nano-surface, C-doping and K-doping, charge transfer via the combination with graphene oxide as well as Ti coatings and TiC coatings are revealed, as shown in Fig. 1. Further, it is expected that the insights of this up-to-date review could guide the synergistic modification strategies to improve the performance of TiO_2 photocatalyst coatings to achieve their maximum potentials.

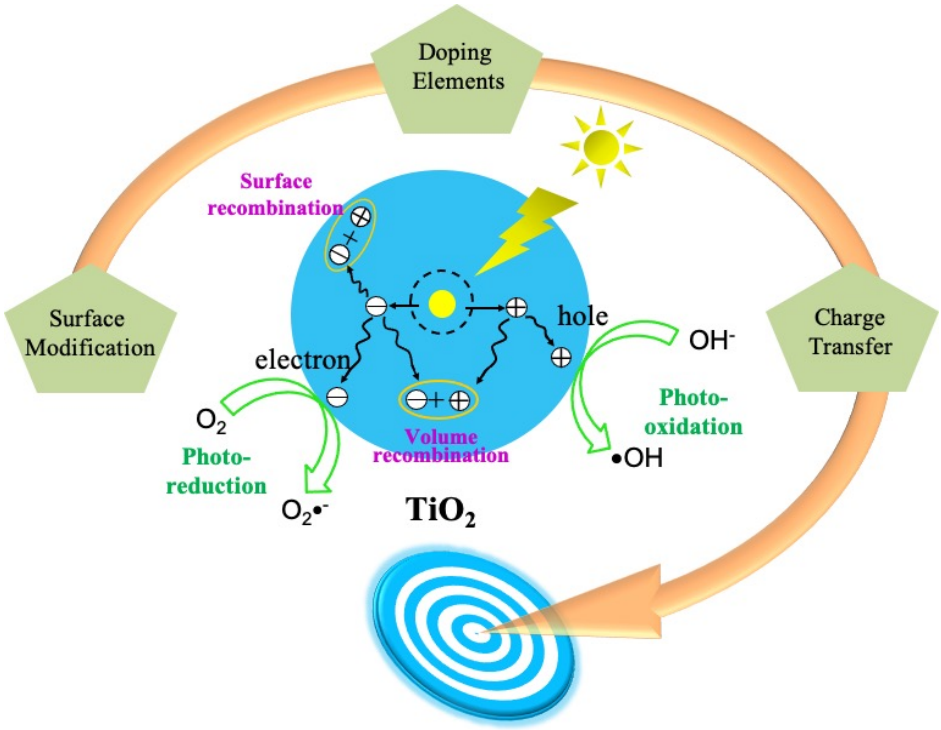

Figure 1. Schematic diagram of the modification strategies of TiO_2 photocatalyst.

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