Mechanism(s) of Photocatalytic Processes: Revisited!

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Charge carrier transfer processes are very important and play a vital role in photocatalytic reactions. The fundamental study of the dynamics of these charge transfer processes is thus crucial from the viewpoint of developing efficient photocatalytic systems for largescale industrialization. The current presentation mainly reviews recent efforts on understanding the charge transfer kinetics in photocatalytic processes. Some fundamental aspects involved in charge transfer processes, such as, charge carrier generation, charge carrier trapping, charge carrier recombination, and electron and hole transfer are discussed based on the results published in the past decades. Moreover, recent studies focusing on the enhancement of the photocatalytic efficiency by improving the charge carrier transfer and separation will also be discussed here. Noble metal loading, plasmonic structure, and graphene loading have been found to be efficient methods to improve charge carrier separation and to suppress charge carrier recombination. Although there have been significant advances in the research of charge transfer dynamics, there are still many processes not fully understood, especially on the molecular-level. There are, for example, hardly any studies associated with electron and hole transfer kinetics in photocatalytic reactions on single crystal TiO_2 surfaces. Most researchers have studied the charge transfer kinetics on a very short timescale, while the charge transfer on a more extended timescale is still unclear. This review highlights the importance of charge transfer processes in photocatalytic reactions the understanding of which can provide possibilities to significantly improve photocatalytic efficiencies.

References:

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