# INNOVATIVE APPROACHES ON FABRICATION OF DEFECTIVE $TIO_2$ FOR PHOTOCATALYTIC APPLICATIONS

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In recent years, there has been significant research interest in defective $TiO_2$. This attention is due to its potential to overcome the limitations of low visible light absorption and fast charge recombination. However, the quest for effectively producing defective yet photocatalytically potent $TiO_2$ remains a challenging topic. One of the central issues revolves around discovering a process that can yield relevant defect structures without requiring exorbitant efforts. Synthesis routes involving reducing atmospheres, such as $H_2$ or a $H_2$/Ar mixture, have become widely adopted for creating defective $TiO_2$ by partially reducing a few nanolayers on the $TiO_2$ surface. The inclusion of Ar enhances the overall safety of the process. Nevertheless, the impact of Ar addition on the surface defects responsible for the photocatalytic process remains uncertain. An obstacle in examining the defect structure is its nano size, which is accessible through precise technologies such as TEM, typically overlooking dynamic and average effects. We present a study that focuses on the influence of $H_2$/Ar mixtures on the photocatalytic activity of $TiO_2$ [1]. Moreover, we show the underlying effect on the defective layer. Furthermore, we present the use of photoinduced enhanced Raman spectroscopy (PIERS), a method we previously utilized for identifying small amounts of organic compounds [2], as an additional analytical approach for examining defect dynamics.

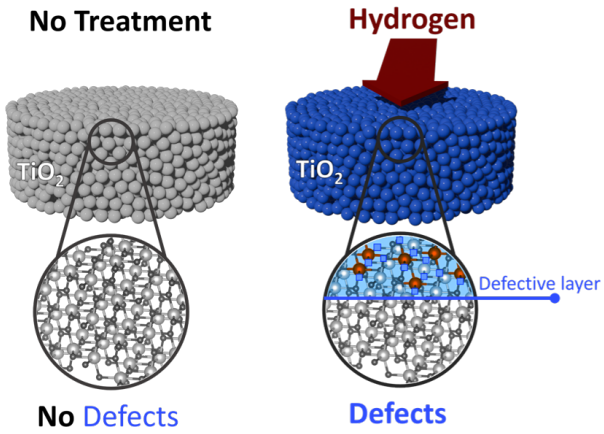


*Fig.1 Schematic illustration of the hydrogenation treatment on $TiO_2$. Partial reduction with hydrogen introduces a defective, disordered surface layer.*

References

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