

# Non-metal Doped TiO<sub>2</sub> films as Visible-light Photocatalysts by Physical Vapor Deposition

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Non-metal (B-, C-, N-) doping into TiO<sub>2</sub> to promote the photocatalytic activities under visible light has been actively pursued in recent years. Physical vapor deposition methods were used to prepare TiO<sub>2</sub>-based films with distinct chemical structures and electronic natures of the dopant species, which would induce red-shifted absorption and improve photocatalytic activities. B-TiO<sub>2</sub> films were prepared by reactive magnetron co-sputtering two targets of Ti and TiB<sub>2</sub> in Ar and O<sub>2</sub> atmosphere. C-TiO<sub>2</sub> films were deposited by two processes: one by ion-assisted electron-beam evaporation of TiO<sub>2</sub> powder source material and CO as the feed gas for the ion gun, the other by reactive magnetron co-sputtering of Ti and graphite targets in Ar and O<sub>2</sub> gases. N-TiO<sub>2</sub> films were also deposited by ion-assisted electron-beam evaporation using TiO<sub>2</sub> powder source material and N<sub>2</sub> as the feed gas for the ion gun, and by reactive magnetron sputtering of a Ti target in Ar, O<sub>2</sub> and N<sub>2</sub> mixtures, respectively. Various dopant species in the films were detected and characterized, and the main species, which were responsible for the red-shift absorption to visible-light and the promotion of the photocatalytic activities, were identified.

Keywords: Titanium oxide; Non-metal doping; Physical vapor deposition; Photocatalytic activity (Photocatalysis)

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