# Design of Visible-Light Sensitive Mesoporous Photocatalyst

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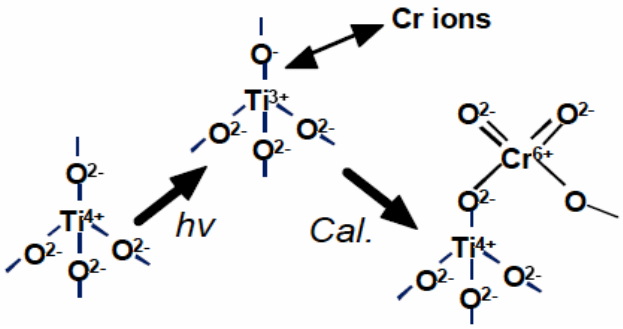
To establish the clean photocatalysis system, it is vital to develop the photocatalysts which can operate efficiently under visible light irradiation with high selectivity [1-4]. Although Ti-containing mesoporous silica (Ti-HMS) can exhibit efficient photocatalytic reactivity and high selectivity for various reactions, these Ti-contaning catalysts can operate as the photocatalysts only under UV light irradiation. In this study, (Cr,Ti)-binary oxide containing mesoporous silica (Cr/Ti-HMS) photocatalyst was prepared by an application of the photo-assisted deposition (PAD) technique and characterized by XAFS, UV-vis and photoluminescence studies.

In the PAD method, Cr ions are anchored on Ti-oxide excited under UV light irradiation and after calcination Cr ions become Cr-oxide. Using the PAD method, the tetrahedrally coordinated Cr-oxide moieties can be anchored on Ti-HMS forming the direct interaction between Cr-oxide and Ti-oxide moieties (Scheme 1.). The Cr/Ti-HMS absorbed visible light in the range of 400-600 nm to indicate that the Cr/Ti-HMS can operate under visible light irradiation, while Ti-HMS absorbed only UV light shorter than 300 nm.

On the Cr/Ti-HMS, photoepoxidation of propylene with $O_2$ under visible light irradiation proceeded and showed high selectivity to produce propylene oxide. The charge transfer excited state of the Cr-oxide moieties anchored on Ti-oxide moieties play a significant role in photocatalytic reactions under visible light irradiation.




Scheme 1. Design of Cr, Ti-binary oxide by the PAD method.

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