

# New catalyst for inducing same oxidation reaction under illumination even in the dark

Can oxidize hydrogen peroxide in the dark

## Overview

Photocatalysts are materials that induce redox reactions under illumination. In particular, it is effective for downhill reactions (oxidative degradation of hazardous and pollutants) and titanium oxide (TiO<sub>2</sub>) which is UV light responsive, is already in practical use. However, TiO<sub>2</sub> photocatalytic technology is limited to small amounts and low concentrations of substances based on the solar light spectrum, and there is a problem that oxidation degradation treatment similar to that under illumination is never induced in the dark conditions.

In his research for application as a photoelectrode and photocatalyst for organic p-n junctions, the inventor found that organic p-n junctions can catalyze (= dual catalysis) the oxidation of thiols even in the dark conditions [1]. In addition, as a result of the intensive research, it was found that the p-type semiconductor (FePc) in the organic p-n junction was oxidized and decomposed in the presence of hydrogen peroxide to produce a cocatalyst for hydrogen peroxide in situ, and as a result, dual catalysis by the organic n-type semiconductor occurred.

Dual catalysis is a new type of catalysis that TiO<sub>2</sub> does not have. The selection of organic p-n junctions and co-catalysts is expected to expand the application range and market size of catalysts for environmental purification applications.

## Product Application

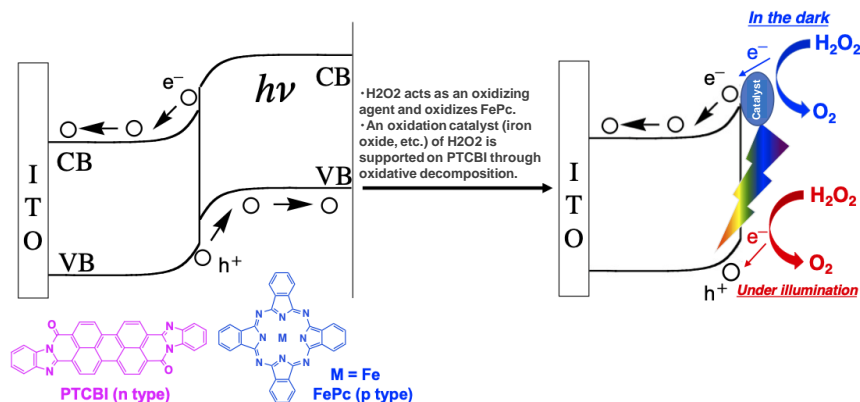
- Catalysts for environmental purification
- Complementation of titanium oxide

## IP Data

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 Admin No. : K23-026

## Fe acts as a cocatalyst and oxidizes hydrogen peroxide even in the dark

### Dual Catalysis Induced by PTCBI Supported with Fe-based Co-catalyst



Catalytic electrode		Rate of hydrogen peroxide decomposition (μmol/h)	
		Under illumination	In the dark
Example 1	ITO / PTCBI / FePc	0.631	0.240
comparative example 1	ITO / PTCBI	0.351	0.058

The decomposition of hydrogen peroxide can be confirmed both under illumination and in the dark, and it is larger under illumination than in the dark.  
 = **Dual catalysis effect**

## Related Works

[1] J. Mater. Chem. A, 2017, 5, 7445

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