光誘起脱炭酸反応を促進する高反応性 PCET 触媒の開発

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Development of a Highly Reactive and Chemoselective PCET Catalyst for Photoinduced Decarboxylation. ([1]*Graduate School of Pharmaceutical Science, The University of Tokyo*)
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In recent years, photoredox catalysis has gained significant attention, leading to remarkable progress. However, it often suffers from low efficiency and generality due to the back electron transfer between substrates and catalysts and the unsatisfactory applicability to substrates with a high redox potential ($|E(sub)| \geq 2.5$ V vs SCE). To expand the applicability of photoredox catalysis, it is desirable to develop photocatalysts that exhibit high redox potential, suppressing back electron transfer. At the same time, high chemoselectivity toward redox-active functional groups is also important to achieve the broad substrate scope and applicability. In this study, we developed a photocatalyst that combines the contradictory properties of high oxidizing activity and chemoselectivity based on a new catalyst design using photoinduced decarboxylation as a model reaction. This catalyst efficiently and chemoselectively promoted decarboxylation of a wide range of substrates, from benzoic acid to trifluoroacetic acid.
Keywords : Photocatalyst; Decarboxylation; Proton-coupled electron transfer; Benzoic acid; Chemoselectivity

近年、光レドックス触媒が広く注目され、著しい発展を遂げている。しかし、基質・触媒間の逆電子移動を抑えて高い酸化還元電位（$|E(sub)| \geq 2.5$ V vs SCE）を発現するには、未だ課題が残されている。光レドックス触媒の適用範囲の拡張のために、逆電子移動を抑制しつつ、強力な酸化還元力を発揮する光触媒の開発が望まれる。同時に、高い基質一般性を満たすためには、酸化還元に弱い官能基に対する高い化学選択性も重要である。今回我々は光誘起脱炭酸反応をモデル反応とし、新たな触媒設計のもと、高酸化力と高化学選択性という相反する特性を両立する光触媒の開発を行なった。本触媒は安息香酸からトリフルオロ酢酸まで広範な基質の脱炭酸を効率的、かつ化学選択的に進行させた。