

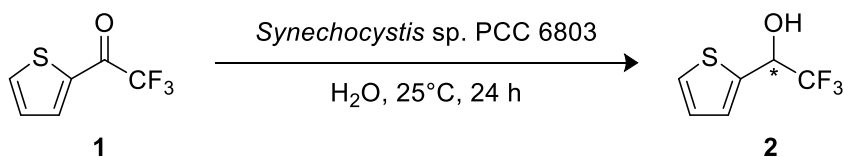
Control of the Enantioselectivity on Asymmetric Reduction of Fluorine-containing Ketones Using Cyanobacterium *Synechocystis* sp. PCC 6803

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Optically active fluorine-containing alcohols are useful chiral building blocks for preparing pharmaceuticals and agrochemicals. The asymmetric reduction of prochiral ketones is one of the most important reactions for obtaining optically active alcohols. We have been studying the asymmetric reduction of prochiral ketones using cyanobacterium *Synechocystis* sp. PCC 6803 as a whole-cell biocatalyst.¹ In this study, we have investigated the factors for controlling the stereoselectivity on the asymmetric reduction of fluorine-containing ketones using *Synechocystis* sp. PCC 6803.

Wild type strain of cyanobacterium *Synechocystis* sp. PCC 6803 was grown in BG-11 medium under illumination (fluorescent light, 20 $\mu\text{mol m}^{-2} \text{s}^{-1}$) at 25°C on a rotary shaker. After 10 days, the solution of a fluorine-containing ketone in DMSO was added to the cell suspension containing cyanobacterium strain ($\text{Abs}_{680-750}$ 0.33) in BG-11 medium. The reaction was carried out at 25°C under illumination of red (660 nm) LED light (10 $\mu\text{mol m}^{-2} \text{s}^{-1}$) or under dark conditions for 24 hours. We found that in the reaction of 2-(trifluoroacetyl)thiophene (**1**), the enantiomeric excess (ee) of the corresponding alcohol **2** changed with increasing the substrate concentration (Scheme 1). For example, the ee value of **2** was 41% (*S*) at 0.01 mg/mL, while it was 84% (*R*) at 2 mg/mL under illumination conditions.



Scheme 1

1) a) S. Tanaka, H. Kojima, S. Takeda, R. Yamanaka, T. Takemura, *Tetrahedron Lett.*, **2021**, 77, 153249. b) S. Tanaka, H. Kojima, S. Takeda, R. Yamanaka, T. Takemura, *Tetrahedron Lett.*, **2020**, 61, 151973.