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# Recent Applications of Laccase in Pharmaceutical and Material Sciences

**Takashiro Akitsu***

Department of Chemistry, Faculty of Science, Tokyo University of Science, Japan

***Corresponding author:** Takashiro Akitsu, Department of Chemistry, Faculty of Science, Tokyo University of Science, 1-3 Kagurazaka, Shinjuku-ku, Tokyo 162-8601, Japan, Tel: +81-3-3260-4271; E-mail: akitsu@rs.kagu.tus.ac.jp

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## EDITORIAL

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Laccase is a family of metalloenzyme of oxidase, so-called blue copper proteins, which exhibits unique properties or various functions in the field of biochemistry, material sciences, and of course pharmaceutical sciences [1]. In chemical aspects, synthesis (catalyst), food, or biosensor areas are main field emerging promising application of laccase. On the other hand, in material aspects, decolourisation of water by ionic polymer-coated laccase [2], improvement of feed for monogastric animals by tuning redox potential of laccase [3], and graphene-cellulose microfiber composite modified screen-printed carbon electrode for sensitive determination of catechol using laccase [4] are outstanding examples of the related studies in recent years.

By the way, functions of laccase not only reduction of molecular oxygen into water but also oxidizing substrates may be useful for pharmaceutical purposes. For example, Jin et al. [4] reported on conditions optimizing and application of laccase-mediator system for the laccase-catalyzed pesticide degradation. Since laccase also belongs to the family of polyphenol oxidase, which potentially act as “green catalysts”. In this paper, in order for establish the best conditions to treat with pesticides, laccase mediator systems have been investigated systematically. A high capacity of laccase from *Trametes versicolor* having possibility of degrading pesticides has been revealed from experiments. Each pesticide required a different laccase mediator concentration typically between 4.0 to 6.0 mmol/L was also observed. In the experiment, the degradation rates of pyrimethanil and isoproturon were considerably faster than those of chlorpyrifos, chlorothalonil and atrazine. The results also showed that the laccase extracted from *Trametes versicotor* with an appropriate mediator promoted the degradations of five selected pesticides including atrazine, chlorothalonil, isoproturon, pyrimethanil and chlorpyrifos. As this study exhibited, mediators and their concentration are also one of the factors in laccase-catalyzed degradation of pesticide. Which are pharmaceutically important chemicals and widely employed in present agriculture to control pests and improve the commodity yield as well as quality.

In contrast, Rodriguez-Delgado et al. [5] studied on biotransformation kinetics of pharmaceutical and industrial micropollutants in grand waters by a laccase cocktail. Contamination of surface water, groundwater, and drinking water is one of serious environment problem of water. Especially, micropollutants in water such as industrial pollutants or pharmaceutical compounds (e.g. antibiotics, analgestics, and anti-inflammatory drugs) are overcome by appropriate reaction conditions avoiding mediators in this study.To establish a methodology for the biotransformation of these pollutants, in this work, a filtered culture supernatant, which contains a cocktail of laccases from *P. sanguineus* $CS_{43}$, was assayed in synthetic and groundwater samples from northwestern Mexico. The results obtained in this study using mild conditions of reaction and avoiding mediators show that ligninolytic enzymes can bio transform certain molecules and the present method can represent an interesting option for environmental and industrial (including pharmaceutical) applications.

In pharmaceutical propose, besides biotechnological development (genome-wide identification of multifunctional laccase gene family) of laccase itself [6,7], catalytic reactions (oxidizing substrates) of which intermolecular electron transfer associated with laccase, and mediators if any and we also focused on our study, plays an important role for reaction of drug compounds.

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