

SYNLETT Spotlight 410

Laccase

Compiled by Chi Zhang

This feature focuses on a reagent chosen by a postgraduate, highlighting the uses and preparation of the reagent in current research

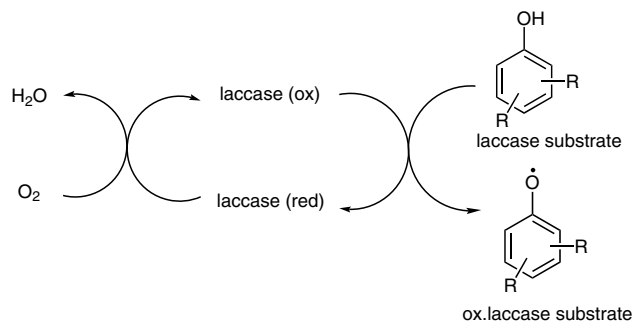
Chi Zhang received her M.Sc. degree from the Dalian Polytechnic University in 2006. She is working towards her Ph.D. degree under the supervision of Professor Kelu Yan at the College of Chemistry, Chemical Engineering and Biotechnology in Donghua University. Her research is focused on enzymatic modification of natural polymers.



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Introduction

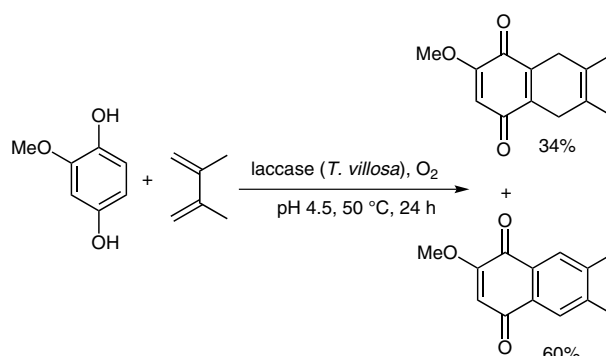
Laccases are blue multicopper oxidases (EC 1.10.3.2) and widely distributed in higher plants, bacteria, fungi, and insects.^{1–3} Some of them have been used in the textile and paper industries as ‘green’ catalysts, because they just require oxygen to catalyze single-electron oxidation of the substrates, and generate only water as by-product.^{4,5} Laccases perform transformations ranging from the oxidation of functional groups to heteromolecular couplings for productions (Scheme 1).⁶



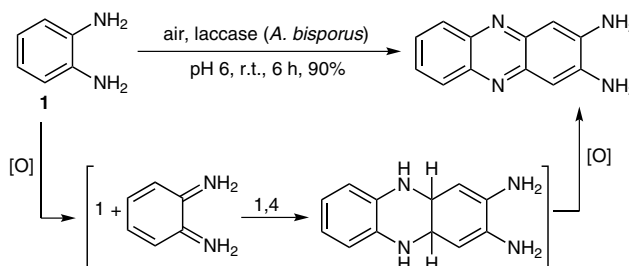
Scheme 1 Principal oxidation reactions by laccase

Abstracts

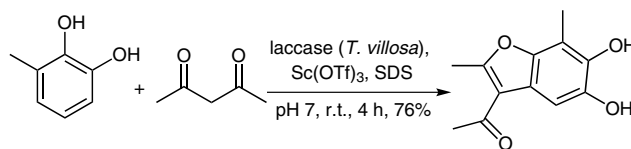
(A) Witayakran and Ragauskas reported a one-pot aqueous synthesis of 1,4-naphthoquinone in the presence of laccase.⁷



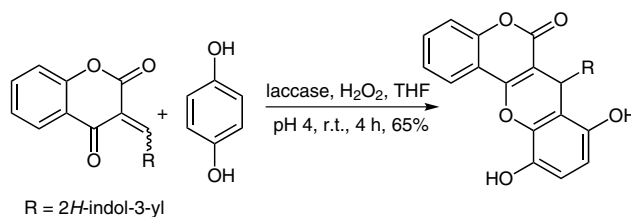
(B) Laccase from *Agaricus bisporus* and air can convert *o*-phenylenediamine into 2,3-diaminophenazine in 90% yield under mild conditions.⁸



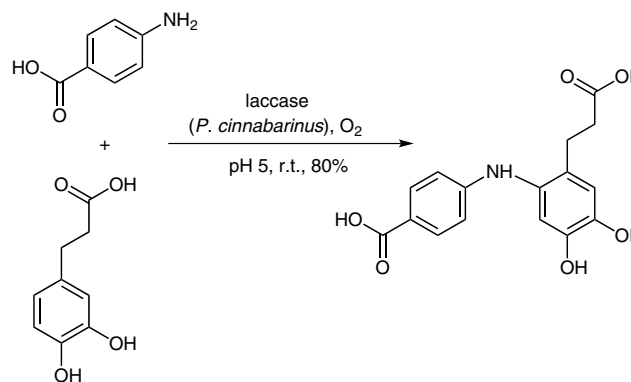
(C) $\text{Sc}(\text{OTf})_3/\text{SDS}$ and laccase were used as recyclable catalysts to efficiently and directly synthesize benzofuran derivatives from the reaction of catechols and acetylacetone.⁹



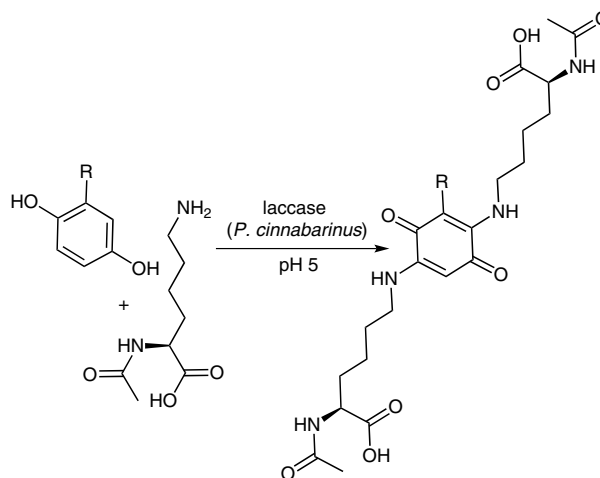
(D) Kidwai et al. have described the mild laccase-catalyzed synthesis of an HIV protease inhibitor, substituted benzopyranocoumarin, in 65% yield.¹⁰



(E) Pilz et al. reported a convenient synthesis of a novel compound, 4-[2-(2-carboxyethyl)-4,5-dihydroxy-phenylamino]benzoic acid, by laccase-catalyzed cross-coupling in 80% yield.¹¹



(F) Proteins containing large amounts of lysine residues can react with dihydroxylated aromatics to form a three-dimensional network through oxidative cross-links in the presence of laccase.¹²



References

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