

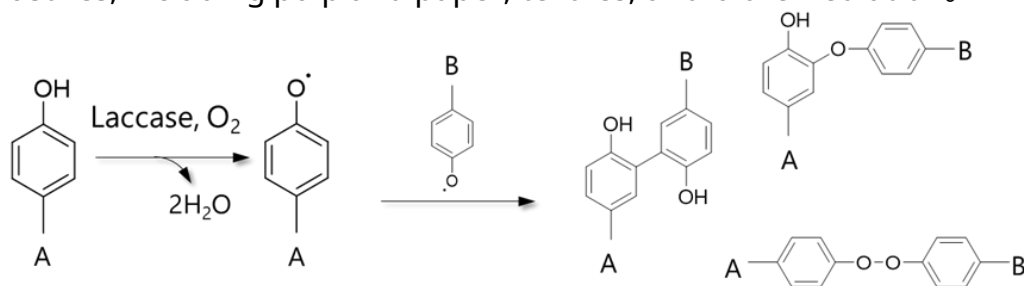
# Laccase

Laccase is widely recognized as an enzyme that primarily oxidizes phenolic compounds. It occurs in many plants, microorganisms, and certain bacteria. At the Nagase Bio-Innovation Center (NBIC), we have focused on laccases derived from *Streptomyces* species and advanced their development using our proprietary N-STePP™ Technology.

Through this work, we have discovered that laccases from actinomycetes exhibit diverse characteristics. These enzymes hold significant potential for applications ranging from industrial processes to environmental remediation. We are actively conducting sample evaluations to explore commercialization opportunities.

## Laccase as a "Green Catalyst"

Laccase is an oxidative enzyme found across a wide range of organisms and is classified as a type of phenol oxidase. It catalyzes oxidation reactions of various organic compounds, particularly phenols and amines (Figure 1). Thanks to its strong oxidative capability, laccase is applied in multiple industries, including pulp and paper, textiles, and bioremediation.



Examples of products formed through radical coupling

Figure 1. Laccase Reaction Mechanism

Its most attractive feature is its role as a Green Catalyst. Laccase uses oxygen to oxidize target compounds, producing only water as a byproduct. This makes it an environmentally friendly catalyst that promotes sustainable chemical reactions—a property that has drawn increasing attention in recent years.

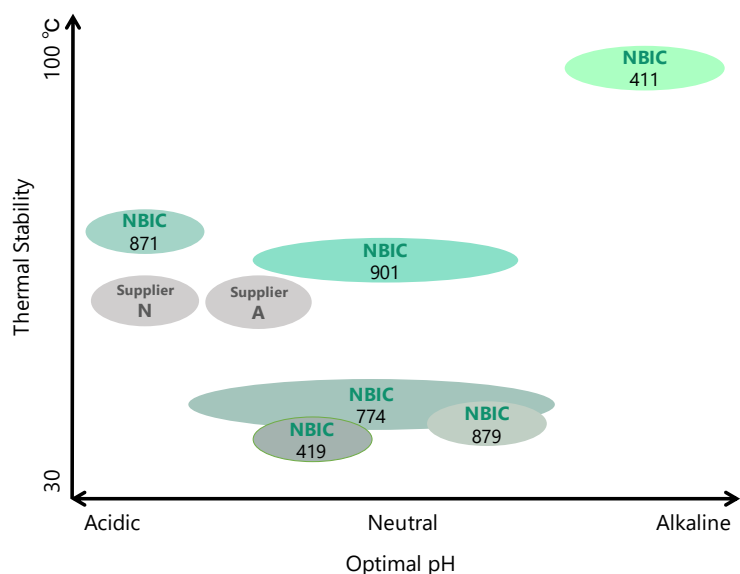


Figure 2. Commercial vs. NBIC Laccase Performance

## Actinomycete-Derived Laccases

At NBIC, we leverage the rich genetic resources of actinomycetes and apply N-STePP™ Technology to develop novel laccases. Interestingly, even within the same genus, laccases exhibit completely different characteristics. Their optimal pH ranges from acidic to strongly alkaline, and their heat tolerance varies from 40°C up to 95°C, demonstrating remarkable diversity (Figure 2).

NBIC provides these actinomycete-derived laccases as samples for customer evaluation. Their applications are wide-ranging, and we aim to uncover potential needs that can only be met by laccases with unique specifications beyond those of commercially available products.