INFINITE ENZYMES

Enzyme Data Sheet

Laccase (Lcc – Partially Purified Enzyme)

A recombinant redox enzyme from *Trametes versicolor* produced in corn seed

10/2017

Infinite Enzymes' **Lcc** (p-diphenoloxidase) is an oxidase enzyme (E.C. 1.10.3.2) from *Trametes versicolor*, a white rot fungus. It is produced in the recombinant corn seed production system (Hood et al., 2003) and sold as a lyophilized powder. Activity is determined using 2,6-dimethoxyphenol.

Laccase is an enzyme present in many microbes, plants and fungi, but is particularly prevalent in wood rot fungi. It is a monomer of 63 kDa from *Trametes versicolor* (Rheinhammar, 1984). ***Trametes versicolor*** –also known as *Coriolus versicolor* and *Polyporus versicolor* –is a common polypore mushroom found throughout the world. Meaning 'of several colors', *versicolor* describes this fungus that displays multiple color schemes. Because its shape and multiple colors are similar to those of a wild turkey, *T. versicolor* is commonly called **turkey tail**.

Lcc contains four copper ions per protein monomer and works as a tetramer. Laccases act on phenols and similar molecules, performing one-electron oxidations, which remain poorly defined. It is proposed that laccases in plants play a role in the formation of lignin by promoting the oxidative coupling of monolignols, a family of naturally occurring phenols. Fungal laccases play a role in the degradation of lignin, and can therefore be classed as lignin-modifying enzymes. Laccases require oxygen as a second substrate for their enzymatic reaction.

Gene ID or Accession Number: U44430

Storage temperature: 4°C as lyophilized powder.

Shipping Temperature: (wet ice)

Suggested shelf life or term of expiration: 6 months

Specific Activity Range or minimum value (units per mg protein)

U = amount of enzyme required to turn over 1 μmole 2,6-dimethoxyphenol min^{-1} at pH=4.5 and 25°C. Not used to calculate activity for this product.

APPLICATION

Laccases have been examined as the cathode in enzymatic biofuel cells, as industrial catalysts, for textile dyeing/textile finishing, wine cork making, teeth whitening, and many other industrial, environmental,

diagnostic, and synthetic uses, as well as in bioremediation and for lignin degradation; pollutant degradation; and chemical reactions on phenolic substrates for manufacturing.

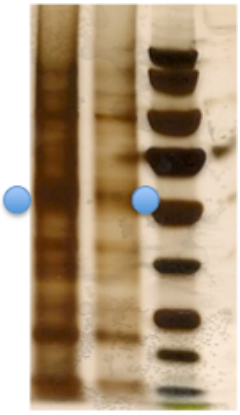
EFFECT OF TEMPERATURE AND pH ON ACTIVITY

Optimal temperature for this enzyme is approximately 45° C, although it functions from 20-45°C. pH optimum is 4.5-5.

PRODUCT CHARACTERISTICS

Purity: ~50%

Silver stained SDS-PAGE gel of partially purified Lcc with MW standards



5 ug 10 ug MW

Infinite Enzymes' partially purified laccase is shipped as a dry powder. The enzyme is standardized in DMP absorbance units per mg of protein. Rate is calculated as the change in absorbance over time (1-9 m).
Rate = 0.2 Abs units per minute.

The enzyme reaction contains
50 mM Sodium Tartrate, pH=4.5 $_2$
40 mM 2,6-dimethoxyphenol (DMP)
Enzyme dissolved in 50 mM sodium tartrate pH 4.5
Assays are performed in polystyrene 96 well flat bottom microtiter plates.
Incubate at 25^{o}C for 5 m. Read absorbance at 469 nm in a BioTek Synergy 2 microplate reader or equivalent.

The enzyme is produced from recombinant maize that is grown under compliance with USDA regulatory guidelines. Unlike other commercially available oxidases, purified Lcc from maize grain is produced without typical impurities (other enzymatic activities) found in fungal-produced enzymes.

Table 1: Lcc characteristics

Parameter	Fungal Laccase—(Lcc)
EC #	1.10.3.2
pH Optimum	4.5-5
Required element	Cu+
Products	Water + activated oxide
MW	55 kDa
References	(Rheinhammar, 1984)

STORAGE CONDITIONS

The enzyme should be stored as a dry powder at 4° C. After reconstitution, store at 4^{o}C or -20^{o}C for long periods.

LITERATURE:

Hood, E.E., Bailey, M.R., Beifuss, K., Magallanes-Lundback, M., Horn, M.E., Callaway, E., Drees, C., Delaney, D.E., Clough, R. and Howard, J.A. (2003) Criteria for high-level expression of a fungal laccase gene in transgenic maize. *Plant Biotechnol J* **1**, 129-140.

Rheinhammar, B. (1984) Laccase. In: *Copper Proteins and Copper Enzymes* (Lonti, R. ed) pp. pp. 2-35. Boca Raton, FL: CRC Press, Inc.