

CLAIMS

1. A laccase comprising all or a biologically active part of the amino acid sequence of SEQ ID NO: 2 or 4, or a functional variant thereof having at least 50% identity to SEQ ID NO: 2 or 4 and exhibiting laccase activity of an enzyme isolated or characterized from a *Deinococcus* or a related bacterium.
2. The laccase of claim 1, which is active at a temperature of 30°C or more, preferably of 40°C or more, and/or which is active in a range of pH from 3.5 to 9.
3. The laccase of claim 1 or 2, wherein the functional variant has at least 60% identity to SEQ ID NO: 2 or 4.
4. The laccase of anyone of claims 1 to 3, which comprises all or an biologically active part of the amino acid sequence of SEQ ID NO: 2, or 4 or 6.
5. The laccase of anyone of claims 1 to 4, which comprises the amino acid sequence of SEQ ID NO: 2 or 4.
6. The laccase of claim 1, which catalyzes biomass modification, preferably lignin degradation or hydrolysis.
7. A polypeptide comprising the amino acid sequence of SEQ ID NO: 2, 4 or 6 or a fragment thereof comprising at least 15 contiguous residues thereof.
8. A nucleic acid coding an enzyme or polypeptide a laccase of any one of claims 1 to 6.
9. A vector comprising a nucleic acid of claim 8.
10. A recombinant cell containing a nucleic acid of claim 8 or a vector of claim 9.
11. The cell of claim 10, which is a *Deinococcus* or a related bacterium.
12. The use of a polypeptide laccase, nucleic acid, vector or cell of any one of claims 1 to 11 for modifying biomass and/or producing metabolites or energy products such as a biofuel.
13. A method for modifying biomass, comprising exposing such biomass to an enzyme laccase, nucleic acid, vector or cell of any one of claims 1 to 12.
14. A method for producing metabolites or bioenergy products, comprising exposing a carbon source to an enzyme laccase, nucleic acid, vector or cell of any one of claims 1 to 13.

1314. A method for wood delignification and/or pulp bleaching, comprising exposing a wood pulp or paper to an ~~enzyme~~laccase, nucleic acid, vector or cell of any one of claims 1 to 910.

14. ~~The method according to any one of claims 11 to 13, wherein said biomass, carbon source or wood pulp further comprises a natural or synthetic mediator.~~

15. A detergent composition, wherein said composition comprises an ~~enzyme~~laccase, nucleic acid, vector or cell of any one of claims 1 to 910.

16. A co-culture of at least two distinct microorganisms, wherein at least one of said microorganisms is a *Deinococcus* bacterium and at least one of said microorganisms is a prokaryotic or eukaryotic cell, wherein said at least two microorganisms are symbiotic to each other, and wherein said at least one *Deinococcus* bacterium ~~exhibits~~expresses a laccase activity~~as claimed in anyone of claims 1 to 6.~~

17. A co-culture of at least two distinct microorganisms, wherein at least one of said microorganisms is a *Deinococcus* bacterium and at least one of said microorganisms is a yeast, and wherein said at least one *Deinococcus* bacterium ~~expresses~~exhibits a laccase~~as claimed in anyone of claims 1 to 6~~activity.