Biotechnological approach for the reduction of VOC in Oriented Strand Boards

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Aldehydes and terpenes are the main sources of volatile emissions in the wood processing industry. Especially long-term exposition to volatile organic compounds (VOC) is suspected to cause harmful conditions in indoor environments. The aim of this thesis therefore was to lower the total emission level of pinewood, the basic raw material for Oriented Strand Boards (OSB), by applying VOC degrading microorganisms or enzymes onto wood. The main focus was laid on the aldehydes pentanal and hexanal and particularly on the three major terpenes in pine wood: α-pinene, β-pinene, and Δ3-carene. While aldehydes and both pinenes were efficiently degraded by specifically selected and adapted *Pseudomonas* strains, Δ3-carene appeared to resist degradation. Therefore, the fungus *Penicillium nigricans* was applied in combination with the bacterial strains and accomplished for the first time a simultaneous reduction of the three major pinewood terpenes including Δ3-carene. In order to boost Δ3-carene degradation to a level that meets industry demands, it was attempted to decompose Δ3-carene by oxidation using the oxidoreductase laccase isolated from the white-rot fungus *Trametes pubescens* as a biocatalyst. In the course of the research, laccase in the presence of a redox mediator system turned out to be very efficient in Δ3-carene conversion into non-volatile oxidation products under laboratory conditions. Moreover, a mixture of bacteria and laccase showed good results in terms of Δ3-carene reduction in pine wood particles. Collectively, the results of the present thesis revealed the potential of biotechnology for reducing potentially harmful terpene emissions from wood products.