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Characteristics of Black Zones Associated with Delignified Wood

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ABSTRACT

Several white-rot fungi cause two micromorphologically distinct types of decay. White-rot fungi typically cause a simultaneous removal of all cell wall components in close proximity to fungal hyphae. This type of degradation results in erosion troughs and holes in the cell walls. In addition, a selective removal of lignin and hemicellulose can occur intermittently throughout the decayed wood. Selectively delignified wood can be characterized by the complete removal of middle lamellae, resulting in a defibration of cells and exposure of cellulosic macrofibrils within cell walls.

A common observation of decay in the field is the association of dark zones with selectively delignified wood. Swollen hyphae containing pigmented materials were commonly associated with the dark zones in wood delignified by *Heterobasidion annosum, Ganoderma applanatum, G. tsugae, Ischnoderma resinosum, Perenniporia medulla-panis,* or *Dichomitus squalens.* Dark zones examined using scanning electron microscopy in conjunction with energy dispersive X-ray analysis were found to contain high concentrations of manganese. Multielement analyses using inductively coupled plasma atomic emission spectrometry indicated approximately a 50-fold increase of Mn in black zones. Pigmented substances containing Mn were readily decolorized with acids. Since large concentrations of Mn were only found in selectively delignified wood, manganese may influence the selective degradation of lignin.

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