An Environmentally Friendly Method for Preparation of Transparent Wood

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The purpose of this research is to establish an environmentally friendly process for manufacturing transparent wood. I focused on improvements of the method described in the paper published in 2021. First, based on the question whether the 30% concentration of hydrogen peroxide used in the lignin modification process in the previous method was essential, I conducted a model experiment using an aqueous solution of lignin and UV-vis spectroscopic analyses. After the experiments under various conditions, I found that lignin could be modified even with 15% concentration of hydrogen peroxide if the amount of lignin is small. Applying these results to the modification of lignin in wood, I could actually modify lignin in balsa wood with a thickness of 1 mm using 15% hydrogen peroxide to obtain the white wood. Next, in order to replace harmful toluene and epoxy resin, which is not degraded in the environment, used in the previous method to make lignin-modified wood transparent, I examined the infiltration of various liquids having a refractive index close to that of glass using a self-made apparatus for vacuum infiltration. After many unsuccessful attempts, I discovered the method using ethanol, hexane, and liquid paraffin. Thus, I succeeded in making lignin-modified wood transparent using only substances that have a low environmental burden. I named the transparent wood produced by this method “paraffin board”. Combining the above two improvements, I have established the method for producing transparent wood that hardly places a burden on the environment from production to disposal.

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