Southern Yellow Pine results in a lower acetylation degree than for radiata pine.

It would be desired to be able to acetylate wood species having a medium to high density such as Southern Yellow Pine to a high acetylation degree and a low residual acetic acid degree, with a method that treats the wood uniformly. In addition, the method should be economical and fast and be applicable on an industrial scale.

Summary ~~of the Invention~~

In order to better address one or more of the foregoing desires, the ~~invention~~ disclosure presents, in one aspect, a process for the acetylation of wood comprising the steps:

(a) in a reaction pressure vessel submerging wood having a moisture content of less than 5% by weight in an acetylation fluid comprising acetic anhydride and/or acetic acid at a temperature of 10°C to 120°C,

(b) increasing the pressure in the vessel to 2 to 20 bar for a period of 1 to 300 minutes,

(c) removing excess acetylation fluid from the vessel,

(d) introducing into the vessel an inert fluid, circulating and heating the fluid until the internal temperature of the wood begins to show an exotherm, controlling the supply of heat to the wood until the exotherm is complete and maintaining the internal temperature of the wood below 180°C,

(e) heating the circulating fluid to a temperature of 85°C to 160°C for a time of 10 to 120 minutes to initiate a second exothermic reaction, controlling the supply of heat to the wood until the exotherm is complete and maintaining the internal temperature of the wood below 180°C,

(f) removing the circulating fluid by evaporation under vacuum.

~~In another aspect, t~~The ~~invention~~ disclosure also for provides acetylated wood having an ovendry density higher than 550 kg/m^3, having an acetyl content of at least 20% by weight and a residual acetic acid content of less than 1% by weight. In a second aspect, the disclosure provides for acetylated wood having an ovendry density between 550 and 800 kg/m^3, having an acetyl content of at least 20% by weight at its geometrical center and a residual acetic acid content of less than 1% by weight.

Detailed description of the Invention

The invention, in a broad sense, is based on the unexpected finding that medium to high density wood species such as Southern Yellow Pine can be acetylated to high acetylation degrees comparable with those for less dense wood species by applying the method of the invention which starts from a lower moisture content of the wood. The acetylated wood has in addition a low residual acid content and a high compression strength.

Without wishing to be bound by any theory, it is believed that this may be caused by difficulties in sufficient impregnation of a highly dense wooden matrix by an acetylation fluid. The lower impregnation efficiency of the wood would then result in lower acetyl levels in the end product. In addition, due to the high density of the wooden matrix it is believed that it is also more difficult to remove the acetylation fluid from the acetylated wood. This leads to a high level of residual acetic acid in the acetylated wood giving it a characteristic odour of vinegar.

The invention especially pertains to the acetylation of medium to high density wood species, such as having a dry density above 400 kg/m^3, more preferably higher than 450 kg/m^3, yet more preferably higher than 500 kg/m^3. In a preferred embodiment, the ovendry density of the wood to be treated is in the range from 500 to 750 kg/m^3.

A particular example of medium to high density wood species is Southern Yellow Pine. Southern Yellow Pine is one of the most durable and strongest softwoods available. The name refers to a group of species which are classified as yellow pine and originate from Southern United States. The most common species of this group includes species Loblolly, Longleaf, Shortleaf and