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Effects of Delignifying Treatments on Mechano-sorptive Creep of Wood II

Set recovery of radial specimens

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Abstract: As an additional step to explain the mechanism of mechano-sorptive (MS) creep, radial specimens of hinoki (Chamaecyparis obtuse Endl.) were subjected to different levels of delignification, and the effect of delignification on MS creep was investigated. In a previous paper, instantaneous and total creep compliance during five moisture cycles under three loading conditions was discussed. In this study, recovery of set of radial specimens described in the previous paper was investigated, and we also compared the results with recovery of set when subjected to a single adsorption or desorption process.

The levels of delignification were three: weak (W), moderate (M), and strong (S) as described in the previous paper. Untreated specimens (C) were also prepared as controls. The loading conditions during moisture cycling were three : "Ad" cycle, "Da" cycle, and "AD" cycle under continuous load. For specimens subjected to a single adsorption or desorption process under load, "A" -process specimens were under load during adsorption, and "D"- process specimens were under load during desorption. The range of adsorption or desorption was between 40% to 94%RH. The concentrated bending load was set at midspan of specimens, and deflections were measured at midspan. For the prepared specimens, recovery of set was obtained during adsorption.

The results were summarized as follows:

1. While the residual set compliance (J_S) after unloading increased by

delignification, The ratio of J_S of treated specimens to controls was proportional to the ratio of instantaneous compliance. It should be noted that delignification brought to MS mechanism remarkable quantitative change, but the qualitative system was constant.
2. The recovery of set after adsorption for "Ad" or "A" was small compared to "Da" or "D" for all delignification levels. Recovery of "Ad" or "A" was slow within the moisture-change range for preparation, and became fast beyond the range. For "Da" or "D" the opposite was the case, and "AD" was constant. Recovery of "AD" was consistent with superposition of "Ad" and "Da".
3. The range of moisture content expanded by delignification, and the upper limit of the range was almost equal to the turning point of recovery curve. The differences of recovery rate before and after the turning point deceased by delignification for "Ad"/"A" set or "Da"/ "D" set.

Keywords: bending creep, sodium chlorite method, superposition principle, creep-set memory

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