ONLINE ISSN : 1880-7577
PRINT ISSN : 0021-4795

Mokuzai Gakkaishi
Vol. 51 (2005) , No. 6 p.357-363

Changes of Mechanical Properties of Wood under an Unstable State by Heating or Cooling

Kensuke OOI[1)], Yue WANG[1)], Teppei ASADA[1)], Ikuho IIDA[1)], Yuzo FURUTA[1)] and Yutaka ISHIMARU[1)]

1) Research Division of Agriculture, Graduate School of Kyoto Prefectural University

(Received February 18, 2005)
(Accepted May 26, 2005)

Abstract: In this paper stress relaxation of water-swollen wood was discussed with two conditions of temperature change, i.e. 1) specimens at 20°C were heated rapidly to 30-80°C, and 2) specimens at 30-80°C were cooled rapidly to 20°C. Stress relaxation was measured in the radial direction for 3 hours after the temperature had changed in 3 minutes. In addition, the fluidity of specimens was defined as the amount of change of the relative relaxation modulus ($1-E_t/E_0$). The results obtained are as follows :

1) When specimens at 20°C were heated rapidly to 30-80°C respectively, their fluidity clearly increased in comparison with the control specimens, which remained at constant temperature for a long time. Accordingly, It is clarified that an unstable state was incurred not only by cooling but also by heating.

2) Under cooling condition, the fluidity of specimens increased in proportion to the degree of cooling ; but under heating condition, the highest value of fluidity was at 50°C or 60°C. The reason for this is that the higher the temperature, the faster the dissolution speed of the unstable state.

3) The relaxation spectrum on a master curve basis shows that the peak of temperature history specimen was located at a short-time region in comparison with control specimen. The apparent activation energy was calculated from the relationship between the shift factor and the reciprocal of absolute temperature. The dates indicate that the value of control specimen was higher than that of

temperature history specimen. Consequently, it is considered that the unstable structure was formed in the cell wall because of temperature elevation.

Keywords: stress relaxation, unstable state, temperature history, amount of fluidity

doi:10.2488/jwrs.51.357
JOI JST.JSTAGE/jwrs/51.357