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## Deterioration Character of Aged Timbers

### Insect damage and material aging of rafters in a historic building of Fukushoji-temple

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**Abstract:** Aged baulk timber in a historic building of Fukushoji-temple (national cultural property) was investigated to estimate the extent of deterioration of aged timbers. The samples were all *Pinus densiflora*, but installed in different years, approximately 1500, 1662 and 1836. They were of similar rank order and built in similar circumstances. The timbers had insect damage by *Nicobium hirtum*. Soft X-ray transfer imaging and density measurements revealed that the insect damage was more severe with increasing age. To discuss change by aging of wood substance itself, insect-damaged parts were eliminated and undamaged parts were investigated : the oxidation temperature and Young's modulus in L-direction seemed to be higher for the present than the aged wood, but clear relation with aging was not detected. X-ray diffraction analysis of undamaged part revealed that relative cellulose crystallinity of aged samples was similar to or rather higher than that of the present sample. The crystallinity was negatively correlated with the Young's modulus. The holocellulose content of the undamaged parts seemed to decrease with aging. These facts imply that slight changes of chemical components other than crystalline cellulose might occur by aging. Comprehensively, in this case, the practical issue was insect damage, rather than deterioration by aging.

**Keywords:** aged wood, crystallinity of cellulose, Young's modulus, holocellulose

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