

ABSTRACTS (MASTER THESIS)

Development of inorganic composite wood molding using hydroxyapatite formation reaction**(Graduate school of Agriculture,
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The depletion of fossil resource and global warming is becoming problems nowadays. Wood as a renewable resource is expected to contribute to restrain those problems. However, the defects of wood such as flammability, easily degradable, poor dimensional stability are problems in the utilization. To resolve these problems, complexation with inorganic compounds has been carried out. However, the complexation has various problems relating to impregnation to wood, chemical safety, and removal of by-products etc. The aim of this research was to develop of wood-inorganic composite molding by using the reaction of hydroxyapatite (HAP) formation. HAP have good biocompatibility and heat-resisting property. In addition, by-products of nitric acid and sodium nitrate generated in the preparation of HAP were tried to use as chemicals for self-bonding of wood.

Method

A HAP aqueous solution was prepared by using calcium nitrate and disodium hydrogenphosphate, and the molar ratio of calcium nitrate and disodium hydrogenphosphate was 5: 3. Wood powder (100 mesh pass) was added to the hydroxyapatite aqueous solution and mixed. The addition ratio of the amount of calcium nitrate and disodium hydrogenphosphate to wood was changed from 0 to 60wt%. After drying the mixture, the mixture powder was poured into a dumbbell-shaped mold for JIS K 7139-1966 A type, and hot-pressed. The obtained molding was stored for a week at 20°C and RH 60%. As evaluation methods, bending test, boiling test, FT-IR analysis, thermal analysis was performed. The influences of the mixing ratio of the amount of calcium nitrate and disodium hydrogenphosphate to wood, drying condition, hot press condition on the physical and chemical properties of the molding were investigated.

Results and discussion

It was confirmed that wood-inorganic composite molding was obtained by using the reaction of HAP formation. The specific bending properties were improved with increasing the amount of calcium nitrate and disodium hydrogenphosphate up to 20wt%. In boiling test, wood-inorganic composite molding with addition ratio of more than 20wt% had good water resistance. Therefore, it was clarified that by-products brought self-bonding of wood. Figure 1 shows the results of TGA measurement. As the addition ratio of the two compounds to wood increased, the final residual weight increased. This indicated that the content of HAP in the molding increased with increasing the two compounds. The behavior of the molding without adding the two compounds (E 0) had two steps behavior indicating flaming combustion and red hot flame. However, the two steps behavior gradually disappeared as the addition ratio of the two compounds increased. This means that the flame retardancy of the molding was improved by the existence of HAP. As results of IR spectra of the molding after the boiling test, the absorption peaks derived from phosphate ion of HAP were observed.

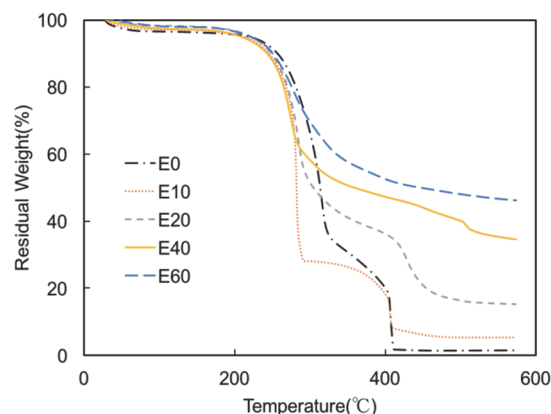


Fig.1. TG of wood-inorganic composite molding.
(20°C/min, Air)