

## INFLUENCE OF CONTAINED ADHESIVES ON THE PYROLYSIS CHARACTERISTICS OF WOOD BIOMASS

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### Abstract

In recent years the use of plywood and laminate lumber as construction material has been increasing rapidly. The wood waste, containing synthetic polymer, such as adhesives, is expected to become a large quantity of material during the next 15-20 years. Although the demand for quality waste wood is increasing, waste wood material mixed with plastics or containing adhesives has low recycling value, and in most cases it is discarded. Therefore, it is necessary to develop techniques for processing it effectively. One technique for creating gaseous and liquid fuel out of wood is pyrolysis. The study investigated the outcome of pyrolysis in which synthetic polymers (plastics and adhesives) and wood biomass from construction materials were mixed at temperatures ranging from 300°C to 500°C at standard pressure and in a nitrogen atmosphere. Taking a compreg as samples, the pyrolysis characteristics of wood biomass mixed with synthetic polymer were studied using a thermogravimetric analyser (TGA). In the TGA measurement, wood containing adhesives was found to have a lower peak temperature of heat weight loss compared with wood not containing adhesives. It was demonstrated this experimental result is caused when the decomposition reaction of cellulose was influenced by adhesives.

**Keywords:** biomass, pyrolysis, compreg, adhesives, cellulose

### 1. Introduction

Japanese detached houses are mainly built of wood. At present the majority of these buildings are demolished and the plot redeveloped within 20-30 years. In recent years, plywood and laminate lumber are more commonly used than solid timber to build houses. This is because it has become possible to employ plywood and laminate lumber which is now produced strong enough to be used as structural members requiring strength and durability, for purposes such as pillars and beams, due to the improvement of adhesive technology for wooden materials. The production of structural plywood has increased about threefold in the last ten years and the production of laminate lumber has doubled. On the other hand, particleboard is a structural element made of finely crushed wood mixed with adhesives and then hardened. It is often used in cheap furniture and for the flooring of apartments. Among wooden boards, particleboard is the most widely produced. Particleboard is mostly made from wood waste and can already be described as a recycled material. In the future, further use of such recycled material is projected. However, such material mixed with plastics (physically mixed or coated on the surface) and material with adhesives (especially adhesives containing nitrogen) has low recycling value, so most of them are discarded as final waste. It is therefore desirable to develop techniques for processing the materials more effectively. One of the techniques employed to manufacture gaseous and liquid fuel from wood is

pyrolysis. We conducted a pyrolysis experiment using approximately 70kg of samples comprising particleboard.

### 2. Materials and Methods

The samples employed were Laminated Veneer Lumber compreg (CPP) and material wood of compreg (CPR) and cellulose. The material wood of compreg was birch. The veneer of the birch raw material was pasted up with phenol resin adhesive. The CPP included 30% of phenol resin adhesive (PF). The composition of the CPP are shown in Fig. 1. These samples were used after being ground finely to 150µm diameter or less. The cellulose in use was purchased from commercial chemical shop (Sigma-Aldrich Chemie CAS No.900).

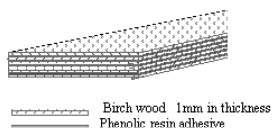


Fig. 1 Structure of compreg

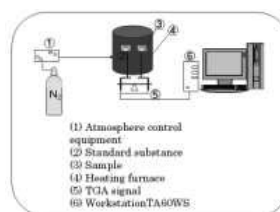


Fig. 2 A schematic diagram of the TGA

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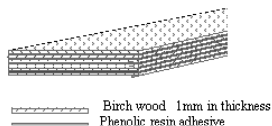


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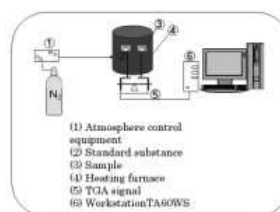


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