ABSTRACT
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Wood is the most important organic raw material from the viewpoint of constructional use. It is a three dimensional polymeric composite made up mainly of cellulose, hemicellulose and lignin which govern almost all its physical and chemical properties. There are several disadvantageous properties such as change in dimension with varying moisture content, biodegradability that causes reduction of strength and stiffness properties, flammability and degradation by UV light, acids and bases, which act as a barrier for using wood in constructional purpose. Therefore, a series of experiment was carried out to study the dimensional stability and other physico-mechanical properties of chemically modified woods such as *Bombax malabaricum*, *Ankhocephalus cadamba* with thermosetting resins like phenol formaldehyde (PF), melamine formaldehyde (MF) urea formaldehyde (UF) and acrylic monomers like acrylonitrile (AN) and acrylamide (AA) with the aim of producing superior quality wood for constructional use.

In the present experiments, for modifying the characteristic properties, the wood was chemically treated to bulk to the maximum levels of weight percent gain (WPG). It was observed that the chemical loading on the treated wood was significantly affected by temperature, pressure, time and concentrations of chemical used during the treatment. However, for getting sufficient levels of chemical loading, the following conditions of treatment were found to be optimum.
Temperature : 90 - 100°C
Pressure : 75 psi
Time : 1 - 2h
Chemical concentration : 30%

The principle of imparting dimensional stability to wood by chemical modification is based on bulking of wood cell walls with reactive chemicals to keep the wood in swollen state at which the wood neither expand nor contract further in contact with water molecule. In the present experiment, it was found that up to 30.4-34.1 levels of WPG, the actual volume of the treated wood increased proportionately with increase in calculated volume of chemical added. Beyond this level of WPG, the calculated volume of chemical added was not found to increase the actual volume of wood. The highest bulking co-efficients (9.52 - 14.14% for B. malabaricum, 9.48 - 14.54% for A. cadamba) of the treated wood samples were found at 30.4-34.1 levels of WPG of the chemicals used. At these levels, the highest bulking co-efficient also resulted the highest moisture excluding efficiencies (30.52 - 45.29% for B. malabaricum, 31.62 - 46.28% for A. cadamba) indicating the blockage of reactive sites of the wood cell wall components by the chemicals and thus preventing the wood components to absorb water molecules. The highest bulking co-efficient and moisture excluding efficiency at 30.4-34.1 levels of WPG ultimately resulted the dimensionally stabilized wood. The dimensional stability (51.23 - 71.32% for B. malabaricum, 48.54 - 70.59% for A. cadamba) also remained unchanged even after three cycles of repeated wetting and drying of treated wood samples. However, PF treated wood samples showed the highest dimensional stabilization (71.32% for B. malabaricum, 70.59% for A. cadamba) followed by MF and acrylonitrile treated wood samples.
That chemical reactions took place between the chemicals used and the wood components were evident from the increased volume of wood in proportion to the volume of chemical added. Moreover, the chemically treated woods exhibited each resistant properties, dimensional stability and high thermal resistant properties.

When the untreated and treated wood samples were tested for strength and stiffness properties, it was found that the MOR of treated wood samples were increased by 7.79 - 21.37% and MOE by 5.40 - 12.18% over the untreated wood samples at 30.4-34.1 levels of WPG. Amongst the treated wood samples, the PF resin treated samples showed the maximum increase in MOR and MOE followed by MF and AN treated samples. As regard to tensile strengths of treated and untreated wood samples, it was found that the tensile strength of the treated wood samples was decreased with chemical treatment. But, decrease in tensile strength for PF followed by MF resin treated samples was found to be the lowest at 30.4-34.1 levels of WPG. The treated wood samples were also found to possess increased hardness in radial direction by 6.09 - 13.02% and that in tangential direction by 5.94 - 11.97% over the untreated wood. However, it was observed that the PF resin treated samples followed by MF and acrylonitile treated ones, showed superior hardness properties in comparison to the samples treated with other chemicals.

As regards termite resistance of the treated wood samples after 12 months' exposure to termite colonies, it was found that the treated wood samples showed higher resistance to termite attack in comparison to untreated wood, which was badly damaged by termite during the above-mentioned period. The treated wood samples, after termite exposure showed a little deterioration in the physical properties. The reduction of strength (1.47 and 1.06% for treated against 28.11 and 27.77% for untreated B. 
and A. cadamba respectively) and stiffness (2.26 and 2.27% for treated
against 30.61 and 28.92% for untreated B. malabaricum, and A. cadamba respectively) of
PF resin treated samples were found to be the lowest followed by MF treated samples.
The determination of chemical constituents mainly the cellulose and pentosan contents of
the treated and untreated woods revealed that these constituents were badly degraded by
termite in the untreated wood, while the degradation loss in the treated samples were
found to be minimum. Here again, the resin treated wood samples showed better
resistance to termite attack as compared to acrylic monomer treated wood samples.

Accordingly, the work presented in this thesis was divided into six chapters. In
Chapter-I, an introduction to the subject was given along with the objectives set for the
present investigation. The Chapter-II highlighted literature available on the subject. In
Chapter-III, the materials and methods employed for the present investigation were
detailed. In Chapter-IV, experimental findings were presented in detail, while in
Chapter-V, discussions on the experimental findings were given. In Chapter-VI, the
results of the present experimental findings were summarized and a recommendation for
further work on the subject was included.