

Innovative green wood-based panels

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INTRODUCTION

Composite wood products, such as plywood, particleboards, medium density fiberboards (MDF), oriented strand boards (OSB), etc., find a variety of applications in our everyday life such as doors, furniture, flooring etc. and so they must be safe for human health. Traditionally, the adhesives used for their production are thermosetting polymers prepared from petrochemical monomers. However, as petrochemicals have been linked to various health problems in recent years, efforts are being made to replace them partially or completely with others that originate from biomass. CHIMAR HELLAS SA and the Schools of Chemistry and Physics of the Aristotle University of Thessaloniki cooperate for the production of wood-based panels with adhesives whose raw materials come from natural resources. This research is carried out in the framework of Cell Suc project (*New bio-polymers reinforced with nano-cellulose suitable for the production of green wood-based panels with improved properties*).

EXPERIMENTAL PART

The new polymers are bio-esters resulting from the esterification of succinic acid with ethylene glycol and/or polyethylene glycol and maleic anhydride. Acrylic acid is used for the cross-linking of the straight chains of these polymers and the development of a network structure.



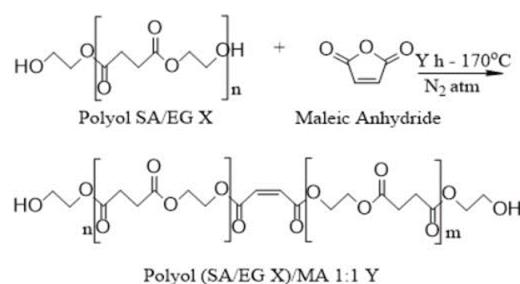
Adhesive system after the addition of acrylic acid

The successful preparation of these polymers was verified by FTIR and XPS measurements.

Thermal studies by TGA have shown that maleic anhydride slightly reduces the thermal stability of the polymer. However, the amount of maleic anhydride does not significantly alter the melting and crystallization temperatures of the polyols.



The melt polymerization device at AUTH



Reaction of polyol synthesis from succinic acid, ethylene glycol and maleic anhydride



The bonding strength of this adhesive system has been tested by applying it to the preparation of small 3-ply specimens using 2.5x15cm birch strips.

The preparation of these samples was analogous to the process used to make plywood panels while the adhesive was used as a honeymoon system by applying the hardener (acrylic acid) on one piece of wood and the polymer to the other. The two parts were joined together and the bonding took place under pressure and high temperature. The samples were evaluated for their shear strength and wood failure performance.

RESULTS

The results were promising and studies on this adhesive system and the conditions for its application in the manufacture of wood-based products are in progress to optimize the results.

ACKNOWLEDGEMENTS:

This research has been co-financed by the European Union and Greek national funds through the Operational Program Competitiveness, Entrepreneurship and Innovation, under the call RESEARCH – CREATE – INNOVATE (project code:T1EDK-01413).