Eucalyptus grandis wood-Portland cement particleboard

Antonio Ludovico Beraldo and José Vitório de Carvalho

Faculdade de Engenharia Agrícola - Universidade Estadual de Campinas - BP 6011
Cidade Universitária Zeferino Vaz - Barão Geraldo 13083-970 - Campinas - SP - Brasil
beraldo@agr.unicamp.br

Abstract

Eucalyptus wood is an important resource in Brazil, mainly for paper and cellulose production and wood particles can be used as component of construction materials. Wood is a renewable raw-material and it presents a lot of advantageous properties such as availability and mechanical strength. Wood mechanical processing generates residues that are not yet well applied. The use of residues from reforestation wood - *Eucalyptus grandis*, in wood-Portland cement composites fiberboard production was the main focus of this research. Harvester cutting conditions (Summer and Winter); sampling position (bottom, middle and top), age of the trees (3, 5 and 7 years); binder types (Brazilian Portland cement type II and type V) were analyzed for this kind of wood-cement composite fabrication. Pressed boards showed good characteristics for construction, mainly in rural areas.

Keywords: composite, wood residues, fiberboard fabrication

1. INTRODUCTION

Eucalyptus tree was brought to Brazil from Australia. Nowadays this raw material is important for a lot of purposes such as paper-making and cellulose fibers production. Some species of Eucalyptus wood can replace tropical wood for construction mainly in rural areas. Sawdust (an important residue from wood process) can also replace mineral aggregate in cement based materials production. However sometimes particle wood and

Portland cement composite fabrication presents problems, because certain wood species are very inhibitory to cement setting. Several researches were conduced searching to minimize this drawback (HACHMI & MOSLEMI, 1989; CARVALHO & BERALDO, 2000).

2 . METHODOLOGY

Eucalyptus grandis trees were collected in Campinas region. Logs of 1.0 m long were obtained from three log positions: bottom (**B**), middle (**M**) and top **(T**). Harvester cutting was done in Summer (**S**- December) and Winter (**W**- July). Trees of different ages (3, 5 and 7 years) were utilized for chip production in a Nogueira device. Wood particles smaller than 2.4 mm were selected and naturally dried in the air. Two Brazilian Portland cement were used: a type II (CP **II**-E-32; NBR 11578) and a type V (CP **V**-ARI- an high initial strength; NBR 5733). Earlier research (CARVALHO & BERALDO, 2000) showed that non adequate composite compression strength was obtained only when *E. grandis* particles from top position and from a 3 years old trees were used. So, for particleboard production this kind of material was not used. Portland cement-wood particles water mixture (ratio 1:0.375:0.75) was placed in metallic mould and pressed (7 kgf/cm^2) during 24 h (figures 1 and 2) in a Charlott device. Particleboard obtained was cured in laboratory during 28 days and then tested according ASTM D-1037.

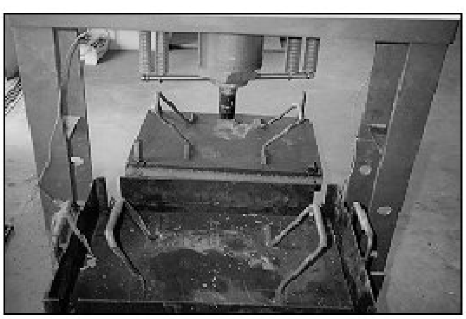


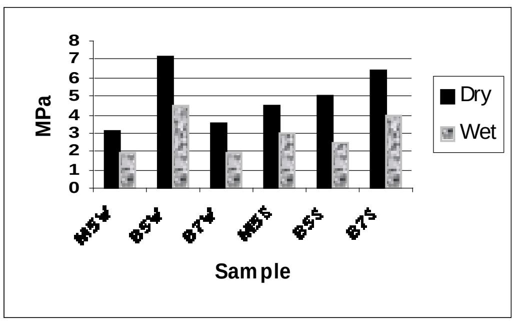
Figure 1- Particleboard production

Figure 2- Composite particleboard

3 RESULTS AND DISCUSSION

Compression strength: according to CARVALHO & BERALDO (2000) for air dried samples particleboard from B5W (i.e. particles from bottom region of a 5 years old tree cut in Winter) showed better results. Figure 3 show that particleboard compression strength was 50% reduced when samples were previously soaked in water, according to ZUCCO (1999) results obtained for rice husk Portland cement particleboards. Nevertheless, composite performance was better than those observed for lignocellulosic organic binders.

Static bending: also B5W and B7S (i.e. particles from the bottom region of a 7 years old tree cut in Summer) showed better performance (figure 4).



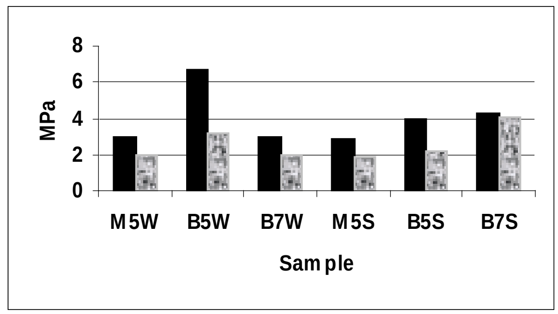
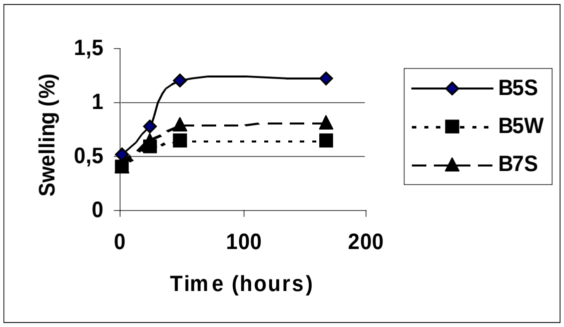


Figure 3 - Particleboard compression strength   Figure 4- Particleboard static bending

Water absorption: particleboard water absorption was very quick. After only 2 hours composite absorption was 30%. However, after 48 hours this value seemed to be constant. Like for tiles and ceramic bricks B5W samples showed only 20% absorption.

Swelling: inhomogeneous performance was observed in composite swelling. Thickness variation was greater than those obtained for others directions (figures 5 and 6). However, composite swelling value was smaller than lignocellulosic organic binders. Results indicated that particleboard composite can be used for non protected constructions, such as external walls.



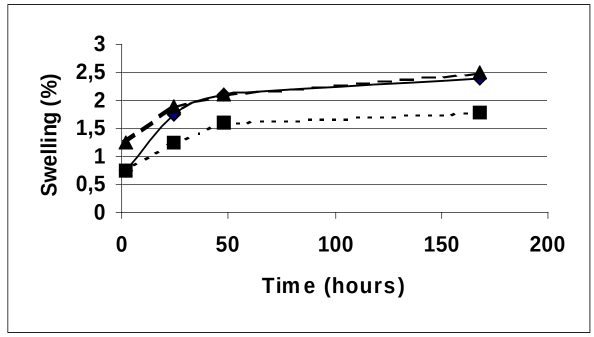


Figure 5- Length swelling   Figure 6- Thickness swelling

4. CONCLUSION

Eucalyptus wood Portland cement composite can be indicated for particleboard production. Physic mechanical particleboard evaluation showed that better results were obtained when a Brazilian type V Portland cement was combined with particles from a 5 years old tree cut in Winter.

5. REFERENCES

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