The Potential of Urban Wood Residues in Particleboard Production

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INTRODUCTION
Introduction

The main objective of the early development of the particleboard production was the utilization of the residues generated in different wood working operations. The unique characteristics of particleboard opened its way into various applications and generated interest among different consumer sectors especially cabinet and home furniture.
Introduction

Kiwi tree residues (Nemli et al. 2003), tea plants residues (Shi et al. 2006) and kenaf (Xu et al. 2004 and Kalaycioglu and Nemli 2006) were investigated as the potential sources of raw material for board production. Even though kenaf was used to reduce the resin consumption, but this procedure required the production of higher density boards which is not possible on the standpoint of industrial production (Xu et al. 2004).
Introduction

Attention has been focused on the reduction of the final board density as the possible way to reduce the raw material requirements. Wang and Sun (2002) utilized wheat straw and corn stalks to produce board of the required quality at lower density. However, the need to use isocyanate resin has limited the application of such material. Murathan et al. (2007) selected the waste carton boards as the potential raw material for board production, but the thickness of the boards was limited.
Introduction

The production of particleboard using wood bark (Blanchet et al., 1998), pine tree needles (Nemli et al., 2008), pine tree cones (Buyuksari et al. 2010) and bark and stem of the coffee branches (Bekalo and Reinhardt 2010) have been investigated.
Introduction

The other alternative raw material investigated for particleboard production was urban and orchard tree pruning which is available in urban area and fruit tree plantations (Enayeti et al. 2008)
Plantanus orientalis
Plantanus orientalis
Plantanus orientalis
Pinus eldarica
Objectives

The severe shortage of wood raw material has forced the investigators to search and use the alternative, uncommon and unconventional wood supply especially urban wood residues. The availability of such wood in urban areas and limitations on wood supply necessitated the investigation to identify the suitability of such material for particleboard production. This was the objective of our research.
Materials and Methods
Material

Pine and sycamore branches were collected from urban tree pruning in the city of Karaj and the grape tree pruning was collected from grape tree yard in Takestan, Ghazvin. Mixed hardwood particles were obtained from Iran Choub Particleboard plant located in the city of Ghazvin. The particles were used as received.
Material

Urea-formaldehyde resin was purchased from Fars Chemical Company resin plant, Shiraz. The characteristic of the resin was as follows: gel time; 47 seconds (Bison Cup), density; 1.285, solid content; 63%, pH; 7.5 and viscosity; 45 seconds. Hardener; industrial grade ammonium chloride was used.
Methods

Particle Preparation

pH and Buffering Capacity and Bulk Density Measurement

Board Making and Testing
Results and Discussion
<table>
<thead>
<tr>
<th>Chips</th>
<th>pH</th>
<th>Acid Buffering Capacity $^1$</th>
<th>Alkaline Buffering Capacity $^2$</th>
<th>Bulk Density kg/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Hardwood</td>
<td>5.36</td>
<td>0.02</td>
<td>0.065</td>
<td>245</td>
</tr>
<tr>
<td>Pine wood</td>
<td>4.90</td>
<td>0.007</td>
<td>0.007</td>
<td>153</td>
</tr>
<tr>
<td>Sycamore wood</td>
<td>4.85</td>
<td>0.0065</td>
<td>0.005</td>
<td>135</td>
</tr>
<tr>
<td>Grape tree residues</td>
<td>5.40</td>
<td>0.02</td>
<td>0.095</td>
<td>139</td>
</tr>
</tbody>
</table>

1- ml 1N NaOH/gram wood, 2- ml 1 N H2SO4/gram wood
IN: Mixed Hard Wood (MHW);
KA: Pine wood;
CN: Sycamore wood;
KC: 50% Sycamore:50% Pine;
IC: 50% MHW:50% Sycamore,
IK: 50% MHW:50% Pine;
IA: 50% MHW:50% Grape tree residues
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We investigated the impact of wood raw material type and the resin dosage on the strength and thickness swelling of the laboratory particleboard. The flexural strength (MOR) of the boards ranged from the lowest value of 11.21 MPa to the highest value of 21.43 MPa. Lower density pine wood produced strongest boards. However, other raw material and the combination of the raw material also produced suitable boards. Modulus of elasticity (MOE) followed the same trend as MOR. Mixed hardwood particles produced highest internal bonding, but the internal bonding of the boards produced using other raw material was more than the requirements of the EN.
The results revealed that any combination of different urban and orchard tree residues can be utilized in particleboard production with the characteristics fulfilling the requirements of EN standard.
Thank You

Any Question Or Comment