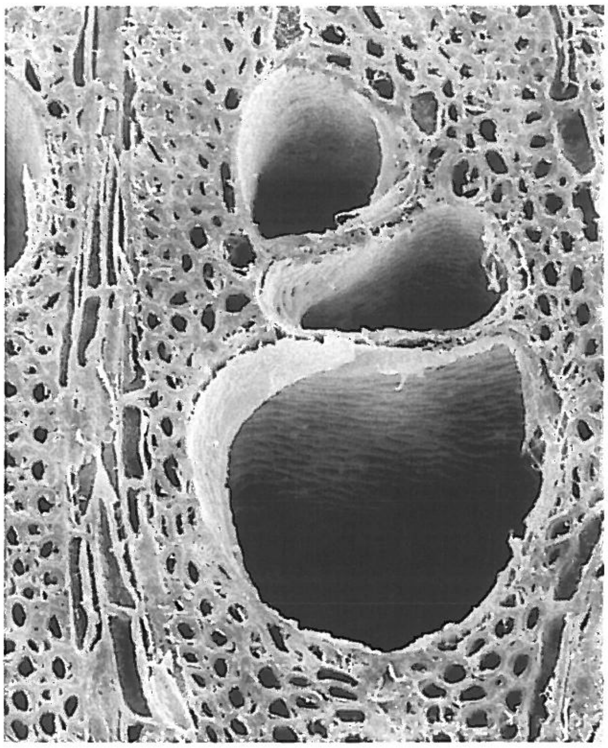
Advances in modified and functional bio-based surfaces

Proceedings



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Contents

Interaction between low density particles and wood

Sandra Monteiro[1], Ângela Dias[2], João Ferra[3], Jorge Martins[4], Luísa Carvalho[5], Fernão D. Magalhães[6]

[1]ARCP-Associação Rede de Competência em Polímeros, Rua Júlio de Matos 4200-355, Porto, Portugal
sandra.mtr87@gmail.com

[2]ARCP-Associação Rede de Competência em Polímeros, Rua Júlio de Matos 4200-355, Porto, Portugal
angela.dias@g.arcp.pt

[3] EURORESINAS-Indústrias Químicas S:A 7520-195, Sines, Portugal
joao.ferra@sonaeindustria.com

[4]DEMad-Dept of Wood Engineering Polytechnic Institute of Viseu, Campus Politécnico de Repeses 3504-510,Viseu, Portugal
jmmartins@estgv.ipv.pt

[5]DEMad- Dept of Wood Engineering Polytechnic Institute of Viseu, Campus Politécnico de Repeses 3504-510,Viseu, Portugal and
LEPABE- Laboratory for Process Engineering, Environment, Biotechnology and Energy, Rua Dr. Roberto Frias 4200-465, Porto, Portugal
lhcarvalho@estv.ipv.pt

[6]LEPABE- Laboratory for Process Engineering, Environment, Biotechnology and Energy, Rua Dr. Roberto Frias 4200-465, Porto, Portugal
fdmagalh@fe.up.pt

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Abstract

Nowadays, it is prominent to obtain lightweight wood-based panels in an effort to facilitate handling and transportation. Furthermore, there is a current trend in furniture design to use high thickness components more readily achieved by a reduction of its weight. There are severel ways to reduce the weight of the panels as the incorporation of low density particles, known as lightfillers, in the core layer. However, it usually leads to a reduction of the mechanical properties such as bending strength and internal bond.

In this work, our goal is to produce low density particles (LDPs) made of crosslinked polyester and their incorporation in lignocellulosic-based panels. Producing lightweight wood-based panels with a lower density, not compromising the physico-mechanical

properties of the final product implies a good interaction between the lightfillers and the wood-adhesive system.

Special attention was given to the interaction between the LDPs and the wood-adhesive system and hence its influence on the panels final properties

LDPs are made of an unsaturated polyester crosslinked with styrene and have an internal multi-alveolar structure filled with air [1] . Particles have diameters in the range of 1-3 mm and internal voids with an average size of 2 □m. For producing these particles a water-oil-water double emulsion is first prepared, resulting in dispersed polymeric particles that are stabilized in an aqueous solution of protective colloids. This is followed by drying and sieving steps, resulting in solid particles with multiple air-filled vesicles. In order to obtain a good interaction between the LDPs and the wood-adhesive system, the influence of two different types of protective colloids was studied: - poly(vinyl alcohol), PVA, and hydroxyethyl cellulose, HEC. These colloids provide the particles' surface covered by OH groups,which increases the compatibility with urea-formaldehyde resin and wood.

By using the two colloids simultaneously during LDPs' production, the particle walls collapse (Figure 1). This problem was solved by removing HEC showed in Figure 2.

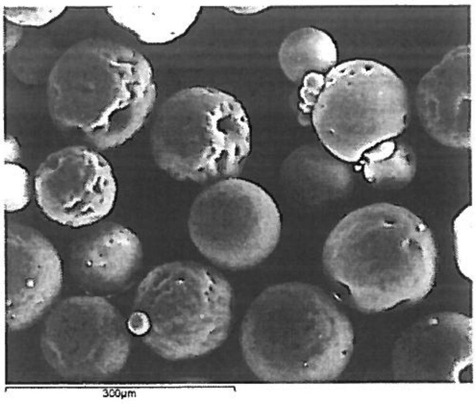

Figure 1: SEM image of LDPs produced with HEC and PVA.

The synthesis process was optimized in order to obtain narrow particle size distributions and particles with density lower than 600 kg/m^3.

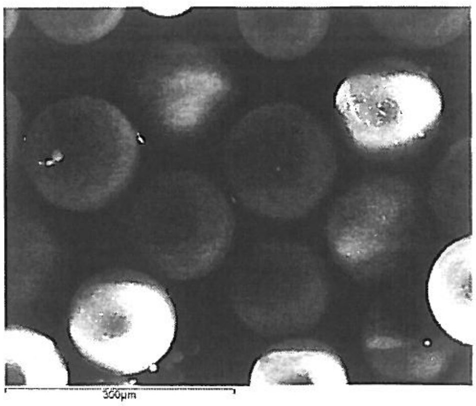

Figure 2: SEM image of LDPs produced with PVA.

When incorporated in the particleboards, LDPs revealed a good interaction with wood (Figure 3), particularly due to the strong polarity of wood which interacts with the OH groups that are present in the particles' surface. Furthermore, these particles seems to not affect the adhesive performance. The wettability between urea-formaldehyde resin and polyester particles was checked by contact angles measurements. The physico-mechanical properties of particleboard panels, such as internal bonding strength and thickness swelling were also determined.

Figure 3. SEM image of LDPs in a lightweigh particleboard.

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