BOND QUALITY OF MELAMINE–FORMALDEHYDE AND LIQUEFIED WOOD MIXTURE BONDED PARTICLEBOARD AS AFFECTED BY PRESSING TIME AND TEMPERATURE

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ABSTRACT

The quality of bond between particles determined by internal bond, surface soundness and also by moisture resistance is important property of particleboards, which depends on many factors such as density and density distribution, particle size and orientation, pressing conditions, type and share of adhesive, etc. Due to high number of wood particle–adhesive interfaces on one side and voids between particles on other side the properties of particleboards greatly depend on the quality of bond between particles. Nowadays most adhesives used for particleboard production are formaldehyde based synthetic adhesives. Because of their impact on the environment, due to the raw material that they are made from and due to formaldehyde emission, researchers, scientist and industry are searching for the adhesive that could and would ensure comparable or even better bond quality with lower environmental impact. One of possible bio based substances that could be used, as adhesive or as partial substitute for synthetic adhesive, is liquefied wood. Liquefied wood is actually decomposed–depolymerized wood conducted at high temperature in the presence of polyhydric alcohols and acid catalysts. Aim of this paper is to present the possibility of using liquefied wood in mixture with melamine–formaldehyde adhesive for production of particleboards and to present the effect of pressing time and temperature on internal bond, surface soundness and shear strength. Three–layer particleboards were made in laboratory condition and were tested on surface soundness, internal bond and shear strength. Particles were blended with adhesive mixture composed from 70% of melamine–formaldehyde adhesive and 30% liquefied wood (solid/solid). Ammonium formate (3% solid/solid adhesive) was used as a hardener, but only in core layer. Pressing was conducted at temperature 180°C for 10 sec/mm at 3 N/mm^2 (normal conditions), except for determination of the impact of time and temperature. Pressing time (pressing temperature was constant at 180°C) varied from 7.5 to 15 sec/mm, and pressing temperature (pressing time was constant at 10 sec/mm) varied from 140 to 220°C. We determined that, compared to control board (no addition of liquefied wood), boards with addition of liquefied wood gave better results. The impact of change in pressing time and temperature is determined as well. The best results were determined at board pressed at 160°C and 180°C for 10 sec/mm, while the worst properties were determined at board pressed at shortest time (7.5 sec/mm).