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Acoustic properties of boards made from mixtures of wood and recycled waste paper fibers

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Abstract: Typically, sound absorption relates to the percentage that effectively decreased when the sound wave hits a surface. Hence, the sound absorption is evaluated by measuring the reverberation time. If the reverberation time is long then the material could be acoustically uncomfortable for most activities. If the reverberation time is too short the material could be acoustically comfortable. In this study, the post-consumer waste papers (office and newspaper) and old corrugated containes (OCC) products were obtained from local waste paper trader, Isparta, Turkey. All the chemicals used in this study were used as received from chemical company. The waste papers separately converted to pulp using a 5 L. capacity, laboratory type standard disintegrator in water. The repulping process was take 30-40 minutes to convert pulp. Then the pulps washed with fresh water and screened on a 100 mesh screen to remove excess water. Then the pulps air dried at 24 hours. After that the pulps was refined a stone mechanical refiner to final fibrillation. The pulps were then dried at 105 °C (± 3); until at least a 3.0% moisture content was obtained. In the production of panels, commercially available urea-formaldehyde (UF) resin was used as binder. After spraying the adhesive on the fibers in a drum blender, the board mat was manually formed inside a wooden box on a metal caul plate. After experimental boards manufactured, then the boards were conditioned at 20 ºC and 65% relative humidity and samples were cut to determine the insulation properties. There are a number of techniques for measuring the acoustic properties of materials. However, the measurement of air flow through a material is a physical property useful in evaluating its performance as an acoustic absorber. The sound absorption properties (Acoustic) of boards were determined according to TS EN 10534-2 standard that at least 12 samples tested with Brüel&Kjaer Tube Type 7758 instrument. With microphones in a pod, 125, 250, 500, 1000, 2000, 4000, 5000, 6300 Hz in the frequency range, sound absorption coefficient of the samples with sound pressure level measured (T).

$$T = (P_1 - P_2)/P_1$$

Where, P1=incoming sound wave pressure, P2=outgoing sound wave pressure.

Keywords: Waste paper, Secondary fibers, Acoustic properties, Composites, cellulose