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Balsa Wood as an Energy Dissipator

The dissipation of energy by a material subjected to a crushing force is determined by its structural efficiency and material efficiency. Structural efficiency is dependent on parameters such as specific energy dissipation, crushing stress, and crushing stress variation; for materials used to absorb crushing forces, elastic rebound should be at a minimum. Material efficiency is concerned with the behavior of the energy dissipator, but it is primarily dependent on thickness efficiency, which determines the quantity of dissipator available to dissipate a given amount of energy; in effect, thickness efficiency is a measure of the failure mechanism in the energy-dissipating process.

Balsa wood, an rf-transparent material, is known to be a structurally- and materially-efficient energy dissipator, but it has not been used extensively because there is very little information on the behavior of the material in various environments. Recently, however, a systematic series of studies have been undertaken to determine the response of balsa wood as an energy dissipator in a variety of environmental conditions; it has been found that the response is very dependent upon the state of the balsa wood as well as the environment to which it is exposed, but certain combinations of conditions serve to increase significantly the energy-dissipating capacity of the wood relative to its normal capacity.

A detailed report describing the results of a study of the energy-dissipating capacity of balsa woods indicates the following: (*1*) Specific energy dissipation and crushing stress increase with decreasing moisture content, decreasing temperature, and increasing denisty. (*2*) Environmental pressure has little effect. (*3*) Thickness efficiency is insensitive to physical and environmental variables. (*4*) Specimen response is unaffected by a small amount of lateral confinement. (*5*) Crushing stress varies in magnitude during mechanical crushing of the balsa wood. (*6*) Frequency of balsa-wood splitting increases with increasing balsa-wood density. (*7*) Specimen response varies as much as ±15% of the average response of specimens tested under the same physical and environmental conditions, which indicates that proper care should be taken in the selection and inspection of balsa wood as an energy dissipator.

Note:

Requests for further information may be directed to:

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References: TSP 73-10388

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Category 04