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Thermal and Acoustic Characteristics of Promised Hybrid Insulation Wasted Materials - Made of Apple of Sodom and Palm Tree Surface Fibers as New Insulation Materials for Buildings

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Abstract

The international trend nowadays is to use natural insulating materials in buildings to be safe for human beings and to lower the environmental impact. Fibers extracted from the pods of the Calotropis procera or Apple of Sodom (AOS) plant are confirmed to have a lower thermal conductivity compared to those extracted from synthetic fibers and close to the ASME standard. The native range of this plant covers south west of Asia and Africa. It occurs also on the Caribbean islands, in Central and South America. Calotropis procera is assumed to be an environmental invasive and it is commonly harvested for its medicinal properties. Calotropis is considered as a weed and it usually controlled by several herbicides to be effective as foliar spray, cut stump, or basal bark methods of control. This presentation shows the other promising good side of such plant, since the fiber extracted from its seed pods can be used as a thermal insulating and absorbing sound materials in building. In this presentation; thermal analysis and acoustic characteristics of Apple of Sodom fibers will be presented with other thermal analyses and microstructure of the fiber. A sample specimen of the developed thermal insulating material is used cornstarch as a binder for the fibers. Other specimens are made as hybrid between the Apple of Sodom fibers and other wasted materials such as palm tree surface fibers (PTSF) to make the specimens more rigid. Infrared (FT- IR) Fourier transformation spectra of all fibers will be presented showing ranges of wavenumber functional groups for both AOS and PTSF. Thermogravimetric analysis (TGA and DTGA) are also obtained showing the stability of both the fibers. The differential scanning calorimetry (DSC) analysis is also reported for all fibers and shows a broad endothermic transition indicating the melting point of the fibers. Sound absorption coefficients are obtained for the hybrid samples and indicate the potential of using these samples for sound absorption.