Physical properties of pressure-prepared pellets of dead leaves

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It is well known that the nnuclear energy and fossil fuel are the typical energy resources which we have used for long time. But there are a lot of severe problems in these resources such as drain on fossil energy, global heating and environments. Recently among these energy resources, the wood pellets have attaracted a lot of attention as a new energy resources because it is a clean resource and carbon neutral.

In the present work we made an attmpt to make a pellet of dead leaves of trees by using high pressure techniques. The pellet of dead leaves has been prepared by using high pressure technique. The physical properties, such as mechanical properties, thermal analysis, combustion experiments, and so forth were studied at ambient pressure.

High pressure was generated by using piston-cylinder apparatus. The fine powder of dead leaves was compressed up to 0.8 GPa. The cylindrical pellets are obtained with the size of 8 mm in diameter and 10 mm high. An example of the pellet prepared at high pressure is showni in Figure 1. We succeeded to prepare the pellets for the dead leaves of bambee, cherry, pine , ginkgo and oak trees.

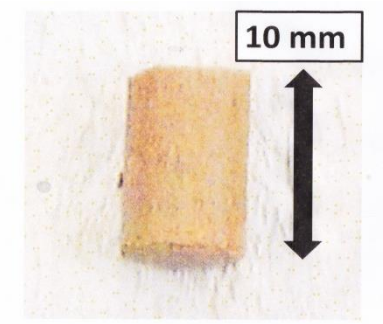

Figure 1 . The prssure-prepared pellet of the dead leaves of cherry tree.

The compressibilities κ (GPa^{-1}) of these pellets are obtained by measuring the pressure dependence of volume at room temperature. We observed a change of the volume by measuring the displacement of piston using dial gauge. The κ's of bamboo and cherry are roughly the same , but larger than that of ginkgo. The magnitude of κ's of these pellets are lareger than that of typical metal of roughly two orders of magnitude.

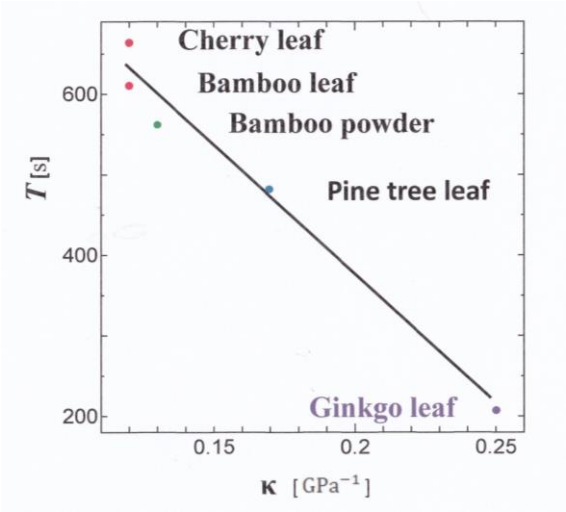

Figure 2 .The relation between *T* and the compressibility *κ.*

Furthermore we observed the time from ignition to burned ash,*T*(s) for these pellets. Figure 2 shows *T* as a function of κ . It is found that the valuss of *T*(s) is related to the compressibility κ of pellets: the *T* of pellets with large compressibility is shorter than that of small compressibility. In other words,the hardness of pellets is important factor to determine the length of *T.*

From the thermal conductivity measurements the pellets have low thermal conductivity, which suggests that the pellets were used as a thermal insulating material. The differential thermal analysis and thermogravimetric analysis show some anomalies corresponding to the temperatures of evaporation of water , ignition and disappearance of red hot state.