Mummified and Partially Petrified Wood from an Eocene Deposit in Mississippi[1]

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Abstract: This study experimentally investigates mummified wood, which is undecomposed wood, and petrified wood from the same piece of material collected at the Red Hills[4] lignite mine in Mississippi, USA. Two kinds of fossilized wood co-exist with lignite. Our work consists of a chemical composition analysis, microstructural observations, and nanohardness testing for material characterization. The chemical analysis revealed that the chemical compositions of mummified wood is similar to those of present wood (carbon based), and petrified wood is mainly composed of silicate (silicon based). From microscopic observations, it is shown that the mummified wood retains well-preserved wood cell structures, and the petrified wood portion has recognizable plant structures. From the observed cell structure, we could assert that the species of the original wood is a conifer. Also, we concluded that chemical reaction would be the main cause for petrification without pressure or heat involved, because no gradient between the mummified and petrified wood was observed. Nano-indentation showed that the nanohardness of the petrified portion is 4.57 ± 3.11 GPa, and the mummified portion is 0.71 ± 0.39 GPa confirming that the petrified wood and mummified wood are clearly different material. To identify the original wood, 185.7 nanograms of DNA from the mummified wood was extracted. The Mississippi Embayment was created during the Paleocene-Eocene geological age. DNA contained in undecomposed wood on one side and petrified wood on the other side indicates a unique depositional environment. This potential DNA from ancient mummified wood may contribute to the growing findings of intact molecules in soft tissue found in fossils. Ongoing sequencing will confirm the identity[4].

Key Words: Mississippi Embayment, Depositional Environment, Fast Petrification.

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4. This work was performed on specimens collected near 33.3101° N, 89.1728° W.