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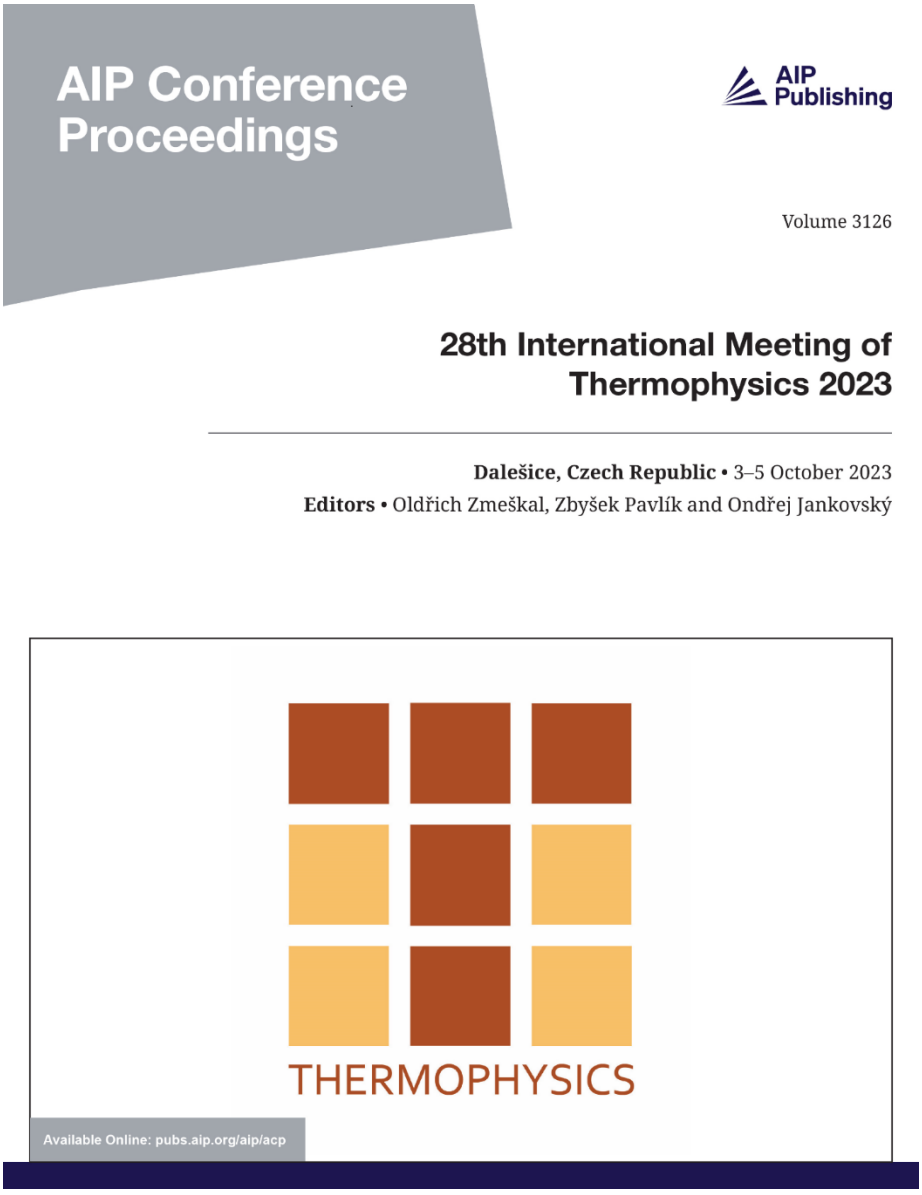

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Investigation of Thermophysical parameters of Historical Fir Wood using Hot Disk Method under room ambience

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Abstract. The study aims were to investigate the Thermophysical properties of fir wood (*Abies alba* Mill.) using the Hot Disk transient method under standard room conditions. The experiment was conducted on fir wood samples from a tree dating back to 1555 years ago examining three distinctive sample orientations: radial, tangential, and longitudinal. The motivation for working with such an ancient wood sample in addition to using a popular transient measurement device was to study the heat transfer behavior with respect to different cut orientations and the relationship between heat penetration depth and thermal diffusivity (κ), thermal conductivity (λ) and volumetric heat capacity (c_ρ). The height of the thermal response curve in the tangential and radial direction showed significantly enhanced thermal response heights compared to the longitudinal direction of measurements. The Thermophysical properties were measured at room temperatures at relative air humidity of 65%. The samples volume density of 414.5 kg m^{-3} and 12% moisture content. The thermal conductivity values measured by the Hot Disk device were in range from 0.115 W $(m\ K)^{-1}$ up to 0.175 W $(m\ K)^{-1}$. The results obtained from the Hot Disk method were also compared to the previously published quasi-stationary method by R. Hrcka, et al., (2017). The validation of the thermal response curves was confirmed by comparing the shape of the thermal responses. The study significantly contributes to the knowledge of the thermal conductivity of fir wood when measured at different cut orientations, providing invaluable insights into the complex Thermophysical characteristics of such wood material.

Keywords: fir wood, thermal responses, heat penetration depth, volumetric heat capacity, orthogonality