

Nanosecond laser ablation of woods: An insight to the ablation characteristics of woods

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In the present paper, a frequency tripled pulsed Nd:YAG laser was used for laser-wood interaction study. The laser ablation characteristics of different wood species (European beech, Radiata pine, and European redwood) were studied in UV (355 nm), blue (532 nm) and IR (1064 nm) regimes. A 5-fold increase in the ablation depth was observed in UV regime as compared to an IR regime. Ablation effects, at high and low laser fluences were examined using scanning electron microscopy to understand the mechanism of laser ablation (photochemical or photothermal) in the UV and IR regimes. Furthermore, the ablation threshold for each of the wood species was measured to understand the mechanism of ablation in woods with varying densities. A range of laser parameters and optical parameters were also studied to obtain high aspect ratio holes. Increases in depth and diameter of the holes were measured at higher laser fluence (2 J/mm^2) and at higher laser pulses (1200). An increased incision rate was observed when the focal point was kept 10 mm below the surface of the sample. Finally, an attempt was made to reduce the undesirable development of a heat affected zone (HAZ) and carbonisation in the wood following its interaction with the laser.

Keywords: Pulsed laser; Ablation; Wood; Heat affected zone; Carbonisation