539
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Title:NDE inspection of terahertz waves in wind turbine composites
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Abstract:An investigation of terahertz waves was made for the nondestructive evaluation of composite materials and structures in the wind turbine. The modalities of the terahertz radiation used were time domain spectroscopy (TDS) and continuous wave (CW). The composite materials and structures investigated include both non-conducting polymeric composites and conducting carbon fiber composites. Terahertz signals in the TDS mode resembles that of ultrasound; however, unlike ultrasound, a terahertz pulse was able to detect a smaller crack hidden behind a larger crack. This was demonstrated in thick GFRP (glass fiber reinforced plastics) laminates of the wind turbine using saw slots. In carbon composites the penetration of terahertz waves is quite limited and the detection of flaws is strongly affected by the angle between the electric field direction of the terahertz waves and the intervening fiber directions. The structures used in this study included both solid laminates and the parts in the wind turbine. The defects and anomalies investigated by terahertz radiation were foreign material inclusions, simulated disband, delamination and mechanical impact damage. The effectiveness and limitations of terahertz radiation are defined and noted for the NDE of composites.
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