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Title:Characterization of hindered amine light stabilizers in polymer matrix using terahertz time-domain spectroscopy

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Abstract:Terahertz time-domain spectroscopy (THz-TDS) technique allows us to analyze plastic additives. A series of hindered amine light stabilizers (HALSs), including TMP, PMP, BB-PMP, Chimassorb 944 119. and and a nitroxide free radical of 4-hydroxy-2,2,6,6-tetramethyl-1-piperidinyloxy (HTEMPO) in the matrix of high-density polyethylene are characterized in the range of 0.2-2.6 THz. TMP, PMP, and BB-PMP exhibit individual well-resolved terahertz (THz) absorption spectra at room temperature. Furthermore, a linear relationship of the content of TMP versus the intensity of it first THz absorption peak are demonstrated with the detection limit of about 1.6% (w/w). In addition, PMP exhibit water-dependent characteristic THz absorption spectra. THz-TDS will afford a potential tool to investigate the stabilizing mechanism of HALS and monitor their evolution. Terahertz time-domain Spectroscopy has been demonstrated to characterize plastic additives, in which various low-molecular-weight hindered amine light stabilizers in high-density polyethylene exhibit individual's "fingerprint" absorption profiles, opening new way to investigate polymer degradation and stability. Copyright © 2012 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.

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Uncontrolled terms: Absorption peaks - Detection limits - Hindered amine light stabilizer - Linear relationships - Low molecular weight - Nitroxide free radicals - Plastic additives - Polymer degradation - Potential tool - Room temperature - TEMPO - Tera Hertz - Terahertz absorption spectrum - Terahertz time domain spectroscopy - THz absorption spectra - THz-TDS

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