Contribution ID : **37** Type : **Oral presentation**

Detecting trace amount of contamination or additives in commercial-grade gasolines by means of THz-TDS time-of-flight spectroscopy

Friday, 8 July 2022 10:00 (20)

Terahertz Time-Domain Spectroscopy (THz-TDS) has recently become an attractive analytical technique in gas, liquid or solid state phase which uses ultra-short bursts of terahertz radiation for probing of the medium properties. We show that straight forward and fast determination of propagation times of THz pulses transmitted through gasoline samples is adequate to detect small, a few hundred ppm fractions (percent by weight %wt.) of water and other contamination in commercial-grade gasoline.
A series of measurements conducted to examine time-profiles of picosecond THz pulses, i.e. their peak amplitude time-positions and delays, was used to investigate compositional change in gasoline. More precisely, the Time-of-Flights (TOFs) of the pulses passing through pure gasoline samples were compared with those transmitted through gasoline mixtures containing de-ionized water and isopropanol at calibrated weight fractions. It was found that the difference between the TOFs expressed as a function of admixture concentration has a universal linear character, independently of admixture type.
In_order to explain this linear dependence, the obtained results were compared with the Gladstone-Dale mixing rule, which presumes that refractive index of a pseudo binary mixture can be expressed as a weighted sum of refractive indices of solvent and dissolved substance with the weights given by mass fractions of the two constituents. We show that when applying this simple model an excellent agreement between measurements and theoretical calculations is obtained, proving good solubility of dissolved substance in gasoline, when the assumption on pseudo binary mixture of gasoline is fulfilled [1].

[1]. K. Stelmaszczyk, E. Karpierz-Marczewska, et al., Appl. Sci. 12, 1629, 2022

Primary author(s) : STELMASZCZYK, K. (CENTERA Laboratories, Institute of High Pressure Physics PAS, Sokołowska 29/37, 01-142 Warsaw, Poland); KARPIERZ-MARCZEWSKA, E. (CENTERA Laboratories, Institute of High Pressure Physics PAS, Sokołowska 29/37, 01-142 Warsaw, Poland); MIKHNEV, V. (CENTERA Laboratories, Institute of High Pressure Physics PAS, Sokołowska 29/37, 01-142 Warsaw, Poland); CYWIŃSKI, G. (CENTERA Laboratories, Institute of High Pressure Physics PAS, Sokołowska 29/37, 01-142 Warsaw, Poland); SKOTNICKI, T. (CENTERA Laboratories, Institute of High Pressure Physics PAS, Sokołowska 29/37, 01-142 Warsaw, Poland; Warsaw University of Technology, Centre for Advanced Materials and Technologies CEZAMAT, Poleczki 19, 02-822, Warsaw, Poland; Warsaw University of Technology, Faculty of Electronics and Information Technology, Institute of Microelectronics and Optoelectronics, Koszykowa 75, 00-662, Warsaw, Poland); KNAP, W. (CENTERA Laboratories, Institute of High Pressure Physics PAS, Sokołowska 29/37, 01-142 Warsaw, Poland; Laboratoire Charles Coulomb, UMR, CNRS 5221, 34095 Montpellier, France)

Presenter(s) : STELMASZCZYK, K. (CENTERA Laboratories, Institute of High Pressure Physics PAS, Sokołowska 29/37, 01-142 Warsaw, Poland)

Session Classification : Fri 08/07 Morning 1 / Abstract ID