

## INFRARED CROSS-SECTIONS OF NITRO-DERIVATIVE VAPORS: NEW SPECTROSCOPIC SIGNATURES OF EXPLOSIVE TAGGANTS AND DEGRADATION PRODUCTS

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Classical explosives such as RDX or TNT exhibit a very low vapor pressure at room temperature and their detection in air requires very sensitive techniques with levels usually better than 1 ppb. To overcome this difficulty, it is not the explosive itself which is detected, but another compound more volatile present in the explosive.<sup>a</sup> This volatile compound can exist naturally in the explosive due to the manufacturing process. For example, in the case of DiNitroToluene (DNT), the molecule is a degradation product of TNT and is required for its manufacture. Ortho-Mononitrotoluene (2-NT) and para-mononitrotoluene (4-NT) can be also used as detection taggants for explosive detection.

In this study, using the exceptional properties of the SOLEIL synchrotron source, and adapted multipass-cells, gas phase Far-IR rovibrational spectra of different isomers of mononitrotoluene and dinitrotoluene have been investigated. Room temperature Far-IR cross-sections of the 3 isomer forms of mononitrotoluene have been determined for the lowest frequency vibrational bands located below  $700\text{ cm}^{-1}$ .<sup>b</sup> Cross sections and their temperature dependences have been also measured in the Mid-IR using conventional FTIR spectroscopy probing the nitro-derivatives vapors in a heated multipass-cell.

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<sup>a</sup>J. C. Oxley, J. L. Smith, W. Luo, J. Brady, *Prop. Explos. Pyrotec.* 34 (2009) 539–543

<sup>b</sup>A. Cuisset, S. Gruet, O. Pirali, G. Mouret, *Spectrochimica Acta Part A*, 132 (2014) 838–845.