ON-SITE & REAL TIME THz MONITORING OF GASEOUS EMISSION FROM A WASTE RECOVERY CENTER

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The Dunkirk waste recovery center continuously treats all of the urban community's household waste by converting it into electrical and thermal energy through incineration. These activities are carried out with a controlled environmental impact, based on continuous improvement. The TeraWaste project explores the potential of high-resolution TeraHertz spectroscopy for continuous monitoring of gaseous emissions by developing an on-site diagnostic unit. The selectivity and the ability to detect in scattering media make it a relevant alternative to current multi-compounds monitoring solutions. In this context, we have dedicated a sub-millimeter wave source based on a frequency multiplication chain for industrial monitoring applications.[1] The spectrometer has been characterized by determining the limits of detection of the regulated polar pollutants. Rotational spectroscopy measurements on real process and emission gases, sampled and analyzed off-line as well as in real time on-site, were performed over several hours and compared with standard reference methods and the certified continuous measurement system. Using an adapted preconcentration/thermal desorption setup[2,3], a quantified multi-species mapping, extended to the various polar compounds absorbing the sub-mm waves of the plant's gaseous emissions, in particular VOCs by discriminating them, will enable the operator to better meet current standards and anticipate potential evolution in the regulations.

[1] doi:10.1109/JSEN.2012.2227055, G. Mouret *et al.* Versatile Sub-THz Spectrometer for Trace Gas Analysis, IEEE Sens. J., 13(1), 133-138 (2013).

[2] doi:10.1109/JSEN.2012.2195487, C. F. Neese *et al.* Compact Submillimeter/Terahertz Gas Sensor With Efficient Gas Collection, Preconcentration, and ppt Sensitivity, IEEE Sens. J., 12(8), 2565-2574 (2012).

[3] doi:10.3390/s19122719, N. Rothbart *et al.* Analysis of Human Breath by Millimeter-Wave/Terahertz Spectroscopy, Sensors, 19(12), 2719 (2019).