

THERMAL OXIDATION VAPORS SCREENED REAL TIME BY NPD/TID

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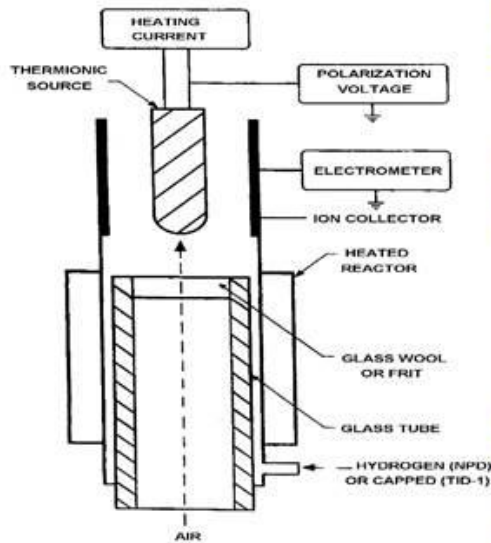
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innovations in chemical detection

REACTOR THERMIONIC IONIZATION ANALYSIS (RTIA)

selective NPD/TID screening of vapors evolved from Thermal Desorption/Oxidation of Liquid & Solid samples

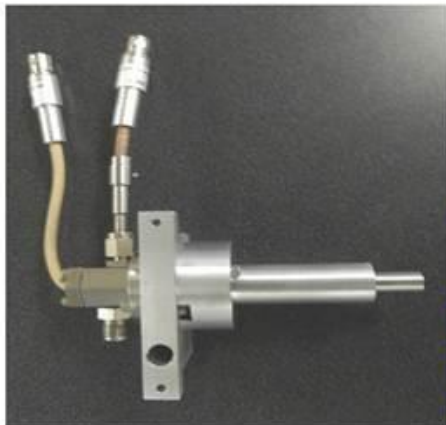
Agilent Technologies recently distributed information on new "QuickProbe" instrumentation involving samples acquired as non-volatile residues or deposits on glass rods. The analysis technique involves inserting the glass rod into a heated inlet for thermal vaporization and subsequent fast GC/MS analysis of the evolved vapors. This new Agilent instrumentation prompted us at DET to reflect back on a chemical screening technique identified years ago by the terminology, "Reactor Thermionic Ionization Analysis"



RTIA involves heated NPD or TID selective detection transducers attached to a heated reactor inlet and an Air sample pump exit. Ambient Air is drawn through both the reactor and transducer to provide the working gas environment for selective ionization detection. For TID detection, Air alone suffices, while for NPD detection, a small flow of Hydrogen is added to the incoming Air stream.

Non-volatile constituents of Liquid samples are introduced to the heated RTIA reactor as residue deposits on a ceramic rod, while Solid samples are deposited inside of glass tubes and sealed such that the incoming Air flows through the sample. Because samples are heated in Air, evolved vapors detected can be both the result of Thermal Desorption and Thermal Oxidation. An attached portfolio illustrates the RTIA technique applied to a wide variety of real world samples. Perhaps the most impressive of these samples was an RTIA signal profile associated with the cooking of raw Hamburger packed in the sample tube.

The NPD/TID transducer used in RTIA equipment evolved from DET hardware designed for retrofit onto older model GC instruments. The transducer consisted of a thumb sized tower structure with a robust ceramic coated ion source positioned on the axis of a collector electrode. This simple structure allowed for streamlined gas flow through the detection region, and was configured with a Swage type inlet fitting for attaching the reactor tubing.



NPD/TID Transducer & Heated Inlet Reactor

Electrical heating and polarization for the wire core of the ion source was provided by a custom built, stand alone DET Current Supply, and signals were measured by a stand-alone Electrometer such as a Keithley 6485. A separate custom built module provided temperature control, and Hydrogen control when needed for the NPD.

See the Attachment for Data Examples.

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RTIA/NPD & RTIA/TID SCREENING OF WIPED SURFACES

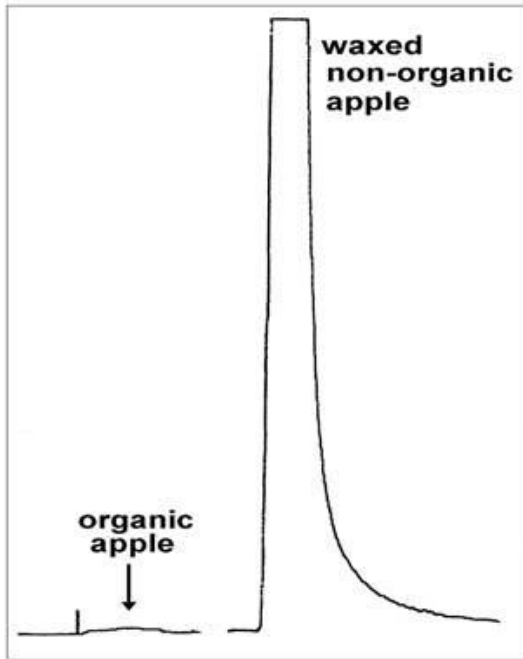


Custom assembled RTIA equipment.

RTIA Process: NPD/TID transducer attached to a heated inlet reactor. Sample residue acquired on end of a 1/16 inch diameter ceramic rod. Rod inserted into hot reactor for thermal desorption/oxidation of residue and NPD or TID selective detection of evolved vapors. Ceramic rod can be re-used by flaming to an orange glow with a Propane Torch to remove previous residue.

WAX COATING ON APPLES

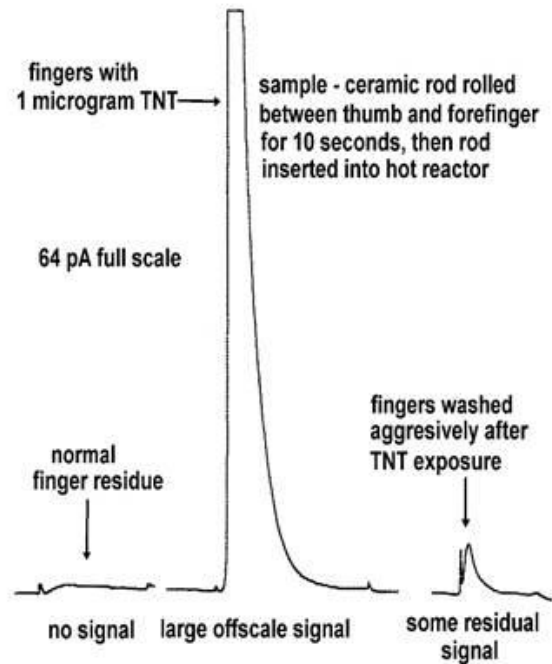
RTIA/NPD - methanol wipe of surface of an apple - wipe transferred to ceramic rod - rod inserted into 275 deg C RTIA



"N" preservative compound in wax provides large NPD signal.

TNT RESIDUE ON FINGER TIP

RTIA/TID-1 - trace TNT deposited on finger tips - ceramic rod rolled between fingers then inserted into 150 deg C RTIA



TID-1 has exceptional sensitivity to Nitro group in para location of TNT molecule. (TID-10 ceramic is a more robust successor to TID-1.)

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