



# IIT MADRAS

Indian Institute of Technology Madras

Technology Transfer Office  
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## Industrial Consultancy & Sponsored Research (IC&SR)

### METHOD OF FIELD INDUCED PHOTOIONIZATION OF MOLECULES USING LOW POWER POINTER LASER IN LASER ASSISTED PAPER SPRAY IONIZATION MASS SPECTROMETRY (LAPSI MS)

**IITM Technology Available for Licensing**

#### Problem Statement

- ❑ The problem statement discussed in the present invention is **how to** detect **saturated & unsaturated hydrocarbons using a laser assisted paper spray ionization mass spectrometry (LAPSI MS) method.**
- ❑ Hence, subject invention addresses the issue efficiently

#### Technology Category/ Market

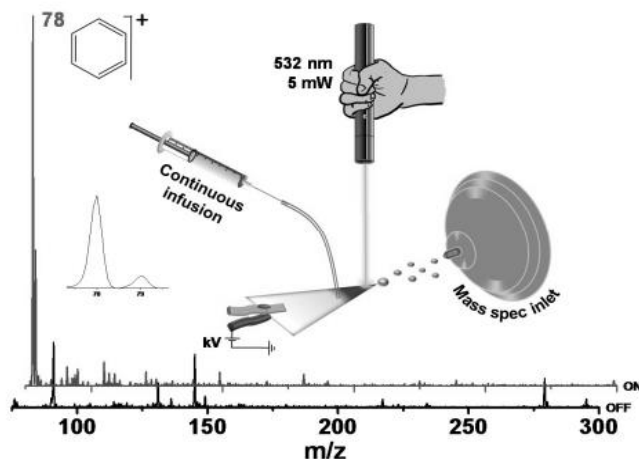
**Technology:** Laser assisted paper spray ionization mass spectrometry (**LAPSI MS**) method;

**Industry/Application:** Edible Oil Industry, cosmetic industry, Special Metal Industry;

**Market:** The global **mass spectrometry** market is projected to reach at a **CAGR** of **6.25%** during the period (**2024-29**).

#### Technology

- ❑ Present patent describes a laser assisted paper spray ionization mass spectrometry (**LAPSI MS**) method for detecting **saturated and unsaturated hydrocarbons.**
- ❑ A **532nm, ≤10mW laser pointer** was shone to a triangularly cut paper along with high voltage, to effect ionization.
- ❑ The analyte solution was continuously pushed through a **fused silica capillary**, using a **syringe pump**, at a preferred **infusion rate.**
- ❑ LAPSI MS showed **enhanced ionization** with **high signal intensity** of analytes. LAPSI MS works both in **positive and negative modes** of ionization.
- ❑ The substrate used to hold the sample includes, a **paper**, a **cloth**, a **polymer surface** (e.g. PVDF) & a **cellulose membrane.**



**Fig.1** depicts Mass spectrum of benzene in presence (greytrace) and absence of laser (black trace).

- ❑ A **clear enhancement of signal intensity** was **visualized** in the **total ion chromatogram** for an **analyte in presence of the laser.**
- ❑ The field-induced distortion of the potential well can be large in paper spray as the fibers constituting the paper are separated at **tens of nanometers** apart & consequently the analyte molecules are subjected to very large electric field of the order of  $10^7$  Vcm<sup>-1</sup>

#### TRL (Technology Readiness Level)

**TRL-4**, Technology validated in Lab;

#### Intellectual Property

**IITM IDF Ref. 1614; Patent No. 480562**  
**PCT Application No.PCT/IN2018/050734**

#### Research Lab

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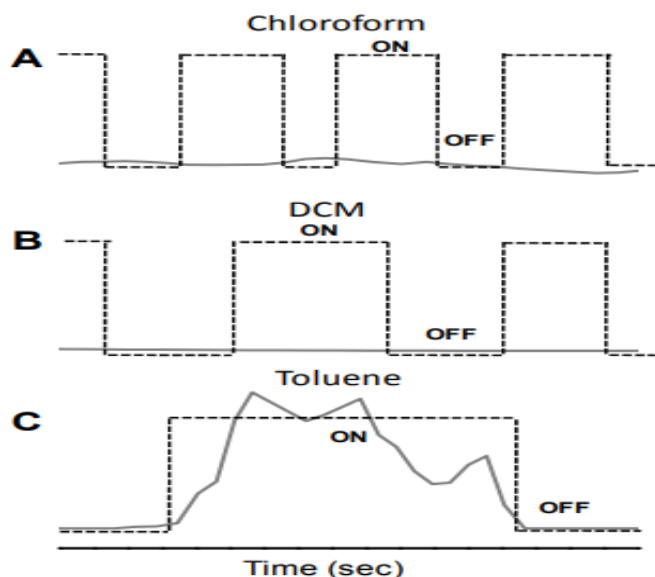
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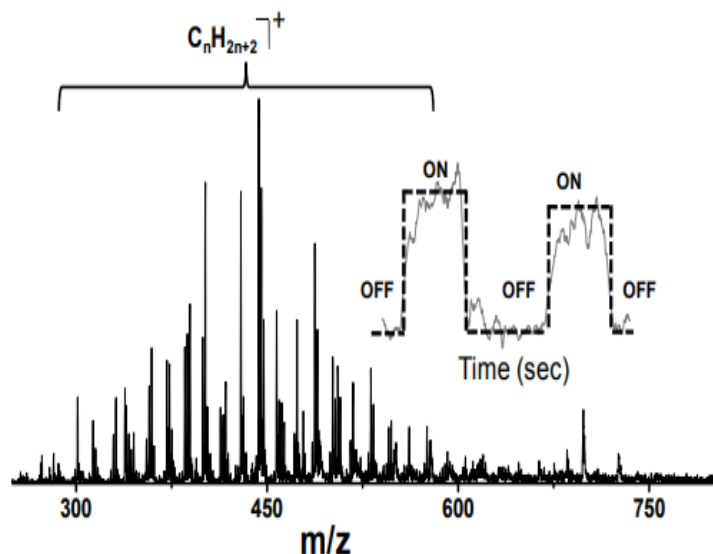
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### Images



**Fig.2** depicts Selected ion chromatogram of C60 using A) chloroform, B) dichloromethane (DCM) and C) toluene at laser on/off conditions.



**Fig.3** depicts Chromatogram and mass spectrum of pure paraffin oil in LAPSI MS in positive ion mode. Presence of the peaks during laser on condition indicates the ionization of the hydrocarbons in LAPSI MS

### Key Features / Value Proposition

Facilitates enhanced ionization with high signal intensity of analytes, which provides field induced photoionization of molecules;

Said method is used to produce clean mass spectrum with enhanced signal to noise ratio.

The substrate can be modified by nanoparticles-coating on it for in-situ monitoring of photo-catalytic reactions on nanoparticles.

The ionization is used for selective detection of an impurity in a mixture.

The laser used is of another wavelength which causes effective ionization by varying the applied potential.

Monitoring in-situ photo-assisted reactions like, the Decarboxylation of marcaptobenzoic acid in presence of gold and silver nanoparticles & dehydrogenation reaction of 2,3-dihydro-1H-isoindole. Impurities like mineral oils were detected in commercially available vegetable oil.

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