A Modified Direct Sample Analysis (DSA) Ionization Source for the Direct Analysis of Thin-Layer Chromatography (TLC) Plates

Gregory T. Winter; Joshua A. Wilhide; William R. LaCourse
Molecular Characterization and Analysis Complex, University of Maryland, Baltimore County, Baltimore, MD 21250

Introduction

Improved manual techniques involve the removal of the spot in question for separate analysis. Ambient mass spectrometry falls into the direct category where the plate remains intact.

Previous Strategies

Mass spectrometry has been applied previously to the analysis of TLC plates. The techniques are divided into two categories, direct and indirect. Indirect techniques involve assist analysis.

Commercial Setup

Schematic

Schlieren Study

Modifications made to Commercial Source

New more rugged heater assembly

Heater provides more gain at low intensity

Smaller nozzle

Improved spatial resolution

Made of glass to prevent electrical arcing

Automated sample xy stage

Manual vertical source adjustment

Camera to monitor sample position

254/365nm UV lamp

External high voltage and nitrogen control

Longer capillary extension

TLC Plate Analysis

Conclusion

The initial desire to better understand the DSA led to a study using salicylamide plates as a test case. This study illustrated how nozzle design can affect resultant ion spectra and gas flow patterns. The knowledge gained from the study assisted in a modification of the platform for the analysis of TLC plates.

The new prototype platform successfully combines an automated sample stage with the modified-source TLC plates, as well as other samples have been studied using this configuration. The improvements to the heater and nozzle assembly reduce the amount of gas leaks and improves gas flow. The smaller nozzle provides more precise sampling over the sample area. To fully utilize the potential of this system additional developments are required.

These developments include:

• More efficient heat transfer to the nitrogen gas
• Improve the gas flow paths to better direct flows
• Develop more compact design
• Develop computer program to integrate all aspects of the software controls
• Improve capillary extension design to better capture desorbed ions

Patent Pending
2014-01981