



REVIEW

# Thin-Layer Chromatography–Flame Ionization Detection

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## Abstract

Thin layer chromatography–flame ionization detection (TLC–FID) is a versatile analytical technique that can be used for fast analysis of organic compounds. It has been implemented in past decades for the analysis of lipids and petrochemical products, but rarely in other fields. Despite the improvement in the latest Iatroscan model and the introduction of an automatic programmable sample spotter, this system is still struggling to gain acceptance in universities and major research laboratories. The reason behind this might be a lack of awareness on the potential application of this system to other fields of analytical chemistry. This review presents TLC–FID as a mature and reliable, state of the art technique that combines the separation power of TLC with FID as a universal detector, which can be applied to the analysis of a wide variety of organic compounds. Basic operational procedures and previous literature, including its potential for ultrafast analysis of commercial samples, are discussed in order to create awareness on the potentials of this piece of equipment to other fields.

**Keywords** TLC–FID · Iatroscan · Lipids · Petrochemicals · Chromarods

## Introduction

Thin-layer chromatography–flame ionization detection (TLC–FID) is a unique system that combines the advantages of FID as a universal detector and the separation capability of TLC to make it a powerful analytical separation technique that can be used for a wide range of component analyses. The introduction of FID as a direct-detection mode for TLC for fast analysis of compounds is a significant improvement over conventional TLC, as it provides both qualitative and quantitative information without any need for the laborious use of a visualization agent. The system is now being marketed as Iatroscan TLC–FID. It has the advantage of analyzing compounds with low volatility as compared to

conventional GC. Compounds without chromophore can effectively be detected by this equipment without any need for chemical derivatization. The principle of separation is the same as that of classical TLC, but its stationary phase is made up of quartz rods (chromarods) exclusively designed for Iatroscan TLC–FID equipment. It is a simple and flexible analytical setup that can easily be adapted to handle difficult matrices.

The concept of using FID as an alternative detector for TLC was first introduced by Padley [1] from Unilever research laboratories in the late 1960s. He used a flame ionization detector and amplifier taken from a gas chromatograph for the analysis of lipids after separation on self-made thin silica glass rods. A relative standard deviation of 1.22% for a standard mixture of cholesterol, methyl palmitate and triolein was reported at that time. Okumura et al. [2] later developed reusable silica gel sintered glass ceramic sticks called chromarods for TLC–FID, which gave birth to what is known today as Iatroscan TLC–FID, after Iatron laboratories obtained the license to manufacture the equipment. This initial work reported the qualitative analysis of various classes of organic compounds after separation on chromarods. This technique was then seen to have potential over a wide range of applications in the field of clinical, biological, medicinal, pharmaceutical and synthetic chemistry, but the non-reproducibility of values and the uncertainty

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# Thin Layer Chromatography With Flame Ionization Detection

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*Thin-Layer Chromatography with Flame Ionization Detection* M. Ranny, 2012-12-06 Thin layer chromatography TLC has become a common and much favoured separation technique in laboratories in widely varied fields in recent years Much of the credit for the introduction of this technique into analytical practice at the end of the 1950s is due to E Stahl This method is simple and is characterized by high separation ability and sufficient sensitivity<sup>3</sup> however some analysts feel that it has passed the peak in its development and will gradually be replaced by the more modern high performance liquid chromatography HPLC This is undoubtedly a very important analytical technique utilizing the specific separation properties of a large number of sorbents and the possibility of regulating the flow rate of the mobile phase by adjusting the pressure Standardization of the experimental conditions is simpler in HPLC than in TLC where the activity of the sorbent and flow rate of the eluent in the thin layer depend markedly on the relative humidity of the laboratory atmosphere and on the composition of the gaseous phase in the elution chamber In addition systems for quantitative detection of the separated ones are better developed for HPLC than for classical TLC where until recently cumbersome and often even insufficiently reproducible chemical or gravimetric analysis of the extracts of scraped off spots or densitometry of the separated zones located first by pyrolysis or reactions with suitable detection agents were the predominant determination methods

**Thin-Layer Chromatography with Flame Ionization Detection** M. Ranny, 1987-06-30 Thin layer chromatography TLC has become a common and much favoured separation technique in laboratories in widely varied fields in recent years Much of the credit for the introduction of this technique into analytical practice at the end of the 1950s is due to E Stahl This method is simple and is characterized by high separation ability and sufficient sensitivity<sup>3</sup> however some analysts feel that it has passed the peak in its development and will gradually be replaced by the more modern high performance liquid chromatography HPLC This is undoubtedly a very important analytical technique utilizing the specific separation properties of a large number of sorbents and the possibility of regulating the flow rate of the mobile phase by adjusting the pressure Standardization of the experimental conditions is simpler in HPLC than in TLC where the activity of the sorbent and flow rate of the eluent in the thin layer depend markedly on the relative humidity of the laboratory atmosphere and on the composition of the gaseous phase in the elution chamber In addition systems for quantitative detection of the separated ones are better developed for HPLC than for classical TLC where until recently cumbersome and often even insufficiently reproducible chemical or gravimetric analysis of the extracts of scraped off spots or densitometry of the separated zones located first by pyrolysis or reactions with suitable detection agents were the predominant determination methods

**Handbook of Thin-layer Chromatography** Joseph Sherma, Bernard Fried, 1991 *Thin-layer Chromatography* Bernard Fried, Joseph Sherma, 1994 This title discusses all phases of thin layer chromatography TLC including the preparation of biological samples prior to TLC general practices of TLC and applications based on compound types Stresses practical rather than theoretical aspects of TLC

compares modern TLC with other separation methods contains extensive coverage of sample preparation methods surveys the latest instrumentation for high performance and overpressured TLC covers current principles and techniques and more

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