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Sorbents and Precoated Layers in Thin-Layer Chromatography

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I. INTRODUCTION

The scientific work of Friedlieb Ferdinand Runge can be regarded as the beginning of thin-layer chromatography.* In 1850 he described the separation of mixtures of dyestuffs by means of a type of capillary force during development on paper (1). The further development of chromatography was due to the work of the Russian botanist and biochemist Michael S. Tswett, who realized the potential of chromatography for analytical and preparative separations. At the beginning of the twentieth century, Tswett was engaged in the separation of plant pigments in columns containing stationary phases such as calcium carbonate (2), and he assigned the term "chromatography" after the Greek words for "color writing." For many years after, chromatography fell entirely into disuse. It was revived again in the mid-1950s by Egon Stahl, who was the driving force behind thin-layer chromatography (TLC) becoming an important analytical method in modern chemical laboratories. This was achieved by Stahl's fundamental work in developing sorbent materials and equipment for thin-layer chromatography. It culminated in his standard handbook (3), which is still considered a "bible" of silica gel TLC work. Stahl's contacts with the chemical industry resulted in the development of a silica gel with standardized and reproducible properties for homemade thin layers in 1956. The introduction of commercial precoated layers in the mid-1960s was first described by Halpaap (4).

These advances were followed by continued development of thin layers with unique selectivity and improved separation efficiency. Examples include

Precoated layers suitable for high-performance thin-layer chromatography (HPTLC)

Combinations of different sorbents on a single precoated layer

Hydrophilic and hydrophobic modifications of bulk TLC sorbents and precoated layers

With this brief historical introduction, the sorbents that are commonly used today in thin-layer chromatography are characterized in terms of their physical and chemical parameters as well as by their resulting chromatographic properties in the following sections.

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*In present linguistic usage the expression "thin-layer chromatography" is used as a generic term for this analytical technique. Here one must distinguish among preparative layer chromatography (PLC), conventional thin-layer chromatography (TLC), and high-performance thin-layer chromatography (HPTLC).