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Inorganic and Organometallic Compounds

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I. INTRODUCTION

Thin-layer chromatography (TLC), discovered in 1938 by Izmailov and Schraiber and standardized by Stahl, is still regarded as one of the most effective techniques for isolation, identification, and quantitative analyses of inorganic and organic compounds. In addition to being an off-line technique in which the various procedural steps can be carried out independently, TLC offers several other advantages such as minimal sample cleanup, wide choice of mobile phases, flexibility in sample detection, high sample-loading capacity, easy accessibility, open and disposable nature of TLC plates, low solvent consumption, comparatively low operational cost, and relatively little need for modern laboratory facilities. The poorer separation efficiency and the influence of environmental conditions on the reproducibility of R_f values have, however, been major disadvantages of TLC compared to high-performance liquid chromatography (HPLC) and gas chromatography (GC).

Izmailov and Schraiber introduced “drop chromatography” and separated certain medicinal compounds on horizontal binder-free alumina spread on a glass plate, with the development done by placing solvent drops on the adsorbent. Meinhard and Hall, 10 years later, used a mixture of alumina and Celite binder to separate Fe^{2+} from Zn^{2+} . This was the first application of planar chromatography to the separation of inorganic ions.

The importance of inorganic TLC received recognition in the 1960s when Seiler separated inorganic substances. After the work of Seiler, the TLC of metal ions received a great impetus. The most important fields of inorganic TLC applications have been the analysis of rock, biological, food, pharmaceutical, industrial, soil, water, and industrial wastewater samples. The work on TLC of inorganics published up to the end of 1972 was reviewed by Brinkman et al. (1), and that appearing in the years 1973–1994 was documented by Mohammad et al. (2–5). An exhaustive review describing the historical background, principle, mechanism involved, and applications of salting-out planar chromatography appeared in 1967 (6). In 1999, Masami (7) reviewed inorganic TLC, presenting the procedural details related to TLC plates, development devices, detection and quantification. The purpose of this chapter is to review the salient work that appeared in the literature on TLC of inorganics and organometallics (8–95) during 1995–2001.

II. METHODOLOGY

Thin-layer chromatography is an off-line process in which various steps are carried out independently. Most workers have used one-dimensional ascending techniques for the development of TLC plates in a presaturated closed chamber at room temperature ($20 \pm 2^\circ\text{C}$). Two-dimensional and reversed-phase partition development techniques have also been used. TLC/HPTLC in combination with spectrophotometry, atomic absorption spectrometry, photodensitometry, stripping voltammetry, and square-wave anodic stripping voltammetry has been used for quantification of