

from the other devices in that a long PTFE capillary tube serves as an eluent reservoir. A PTFE capillary (D), with an inner diameter of approximately 1.5 mm and several meters long, is mounted wavelike on a table (E). The eluent fractions are sucked into the capillary tubing in reverse order. The device (3,6,7) basically consists of a chromatographic plate (P) (Fig. 4), covered with glass plate, the all-glass distributor (C), Teflon tubing (D), and the table (E).

Consecutive portions of the eluents, with increasing amounts of the more efficient solvent, are introduced and stored in a length of PTFE tubing. The outlet of the PTFE tubing is put into the distributor hole, and the eluent coming out of the tube is distributed along the lower edge of the adsorbent layer. The stepwise gradient thus obtained is analogous to a continuous gradient because the profile becomes diffuse in the development process.

Sander and Feld (16) used a liquid chromatograph (solvent programmer in conjunction with two pumps) to generate a mobile-phase gradient. The eluent was introduced into the developer trough and distributed across the layer.

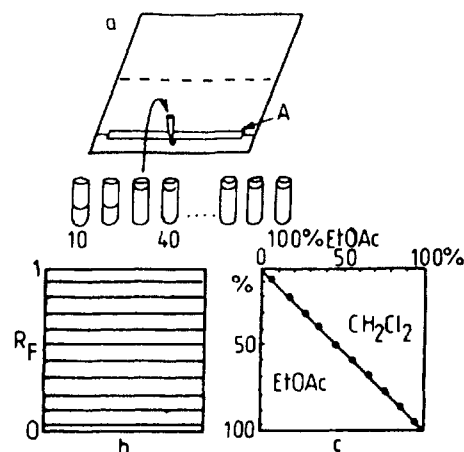
Soczewiński and Matysik (21) proposed a simple device, without a magnetic mixer, coupled with a horizontal sandwich chamber. The device consists of two vessels with two solvents, which mix spontaneously owing to density differences and the formation of molecular complexes (e.g., chloroform–ethyl acetate). They also showed (22) that stepwise gradient elution can be easily performed in a sandwich chamber with a glass distributor (41,47) (Fig. 5). Matysik and Soczewiński (23) also described a device that is a modification of the system introduced by Niederwieser and coworkers (7,43,44).

Burger (17) and Jaenchen (18,19) described a fully automatic machine for multiple development of a plate. An elution gradient is employed in accordance with the gradient program (see also Chap. 5 in this Handbook).

Vajda et al. (20) applied a device originally used for overpressured layer chromatography (OPLC) to multiple step-gradient development. The modified OPLC equipment, with loops filled with the different solvents, can generate a stepwise gradient by switching solvents with a two-position, 10-port valve (for details, see Chap. 7 in this Handbook).

## B. Devices for Achieving Stationary-Phase Gradients

Discontinuous gradients in the stationary phase can be conveniently produced using a normal TLC spreader. The spreader cylinder is divided into two (32) or more (31) compartments by the intro-



**Figure 5** Stepwise gradient elution in a sandwich chamber with a glass distributor (A) of the eluent. (a) 0.4 mL portions of eluents of increasing solvent strength are introduced under the distributor and from the edge of the layer; (b) developed chromatogram with zones of the mobile phase and a stepwise profile of the gradient; (c) corresponding graphical representation of the (approximated) continuous gradient. (Reprinted from Ref. 22 with permission.)