Table 3 lists some important substance classes that have been separated on silica gel by partition chromatography.

In reality, pure adsorption or partition retention mechanisms ordinarily do not occur. On the contrary, in many cases a combination of both retention mechanisms is operative. To increase selectivity, adsorption and partition can be applied not only simultaneously but also in a controlled way, one after the other, in what is called "multidimensional chromatography."

B. Aluminas

The use of aluminas as stationary phases or supports for liquid stationary phases in thin-layer chromatography is of importance for some fields of application, but it is less widespread than the use of silica gels.

1. Physical and Chemical Properties

Aluminas used in thin-layer chromatography have the formula Al_2O_3. Surface-active centers of these types of alumina are hydroxyl groups and oxide ions (O^{2-}) (60). The average density of hydroxyl groups of the aluminas is about 13 μmole/m^2 (61). Chromatographic properties of alumina are also influenced by the adjusted pH value. Three ranges of pH values have proved suitable: aluminas with pH values of 9.0–10.0 are designated as "basic"; "neutral" in this connection means pH 7.0–8.0; and "acid" aluminas have pH values of about 4.0–4.5.

A number of physical parameters are necessary to standardize chromatographic properties of aluminas in thin-layer chromatography. Because these aluminas are porous materials, the parameters characterize the pore structure and specific surface area. The values of pore diameters, specific surface areas, and pore volumes of aluminas most frequently used in thin-layer chromatography are listed in Table 4.

As with silica gels, the chromatographic separation efficiency of aluminas is determined by the mean particle size and the particle size distribution. The respective numerical values are of the same order of magnitude as in the case of silica gels for TLC and PLC. Methods of measurement for these parameters are identical with those described in Section III.A.1.

2. Adsorption Chromatography

The majority of applications of aluminas as sorbents in thin-layer chromatography are based on adsorption mechanisms. Aluminas 60 and 90, with their large specific surface areas, are the most

Table 3 Applications on Silica Gel in Partition Chromatography

Substance class	Reference
Aflatoxins	39
Alkaloids	40,41
Antibiotics	42,43
Carbohydrates	44–46
Glycosides	47
Lipids	48,49
Nucleotides	50
Peptides	51
Pesticides	52
Phenols	53
Steroids	54,55
Sulfonamides	56,57
Sweeteners	58
Tetracyclines	59