acidic mobile phases. Although there is limited retention in RP-TLC, the separation of oligonucleotides on amino layers based on differences in hydrophobic properties of the compounds has been reported. Diol plates can operate with NP- or RP-TLC mechanisms, depending on the mobile phase and solutes. Polar compounds show reasonable retention by hydrogen bond and dipole-type interactions in the former mode, and in the RP mode retention is low but higher than with amino layers. A study of mixed mechanisms on cyano, amino, and diol layers was reported (115).

E. Layers for Enantiomer Separations

Commercial layers are available for separation of enantiomers by the mechanism of ligand exchange under the names Chiralplate (Macherey-Nagel) and HPTLC CHIR (Merck). These consist of a glass plate coated with a reversed-phase silanized silica gel and impregnated with the Cu(II) complex of (2*S*,4*R*,2′*RS*)-*N*-(2′-hydroxydodecyl)-4-hydroxyproline. Separation is based on the formation of diasteriomeric chelate complexes between the central cupric ion, the chiral selector, and the solute. Enantiometric resolution is achieved if the antipodes of the chiral solute form complexes of different stabilities. The history of chiral ligand exchange in TLC and column liquid chromatography has been reviewed (116).

In addition to ligand exchange, enantiomeric separations have been carried out using cyclodextrin-containing mobile phases with hydrophobic C_{18} (117) and cellulose triacetate (118) layers (inclusion TLC). Chiral selectors have been impregnated into silica gel layers for NP-TLC enantiomer separations, e.g., the macrocyclic antibiotic vancomycin for DL-amino acids (199) and L-lysine and L-arginine for β-adrenergic blocking agents (120). Unmodified cellulose has been used for separation of enantiomeric amino acids and peptides and other compounds (e.g., 121). Optical isomers can be derivatized and separated without using impregnated plates or a chiral mobile phase, e.g., amino acids derivatized with 1-fluoro-2,4-dinitrophenyl-5-L-alanine amide and separated by RP-TLC (86).

The newest approach is the preparation of molecularly imprinted polymers (MIPs) for use as chiral stationary phases in TLC. For example, the direct separation of enantiomers of adrenergic drugs on MIPs of (−)-pseudoephedrine and (−)-norephedrine was demonstrated as a rapid, sensitive, and reliable method for quality control of these compounds (121a). Beta-blocking drugs and nonsteroidal anti-inflammatory drugs have also been separated on molecularly imprinted chiral layers (121b).

Enantiomeric separations by TLC have been reviewed (122–124), and this topic is covered in Chapter 17 of this Handbook.

F. Miscellaneous Layers

Cellulose has been surface-modified to produce RP (acetylated cellulose), weakly basic anion-exchange [polyethyleneimine (PEI), aminoethyl (AE), diethylaminoethyl (DEAE), and ECTEOLA], or weakly acidic cation-exchange [cellulose phosphate (P) and carboxymethylcellulose (CM)] layers. These cellulose exchangers have open structures that can be penetrated by large hydrophilic molecules such as proteins, enzymes, and nucleic acids.

Polygram Ionex-25 precoated sheets (Macherey-Nagel) are polyester sheets coated with a mixture of silica, a polystyrene-based strong acid cation-exchange or strong base anion-exchange resin, and a binder. The cation exchanger has been used to separate and identify amino acids in biological samples (125), and both are suited to inorganic ion separations. A large variety of inorganic ion exchangers, such as titanium(IV) silicate (126), have been prepared and used mostly for metal ion separations.

Size-exclusion gel TLC has been carried out on dextran (Sephadex) gels with controlled pore sizes. These layers, which are used to estimate molecular weights and separate and determine biological macromolecules (e.g., enzymes and serum proteins), are used in totally swollen condition and developed continuously in the descending direction.

Combination layers with a C_{18} strip adjacent to a silica gel layer (Whatman Multi-K CS5) or a silica gel strip adjacent to a C_{18} layer (SC5) are available for 2-D TLC with diverse mechanisms (RP phase and adsorption).