Waters
Lab Highlights
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BARE SILICA GEL AS AN ALTERNATIVE REVERSED-PHASE SUPPORT FOR ORGANIC AMINE SAMPLES

It is possible to eliminate the problems of tailing of amines on bonded phases by changing to bare silica gel as the adsorbent with aqueous eluents. Many separations of lipophilic amines which are very difficult on bonded reversed-phase packings are easily accomplished with good peak symmetry on silica. Retention of organic amines on silica using reversed-phase eluents appears to be dependent upon electrostatic and adsorption forces. By use of inorganic or organic ions as retention modifiers, separations can be adjusted.

The organic amines shown below, chlorpheniramine and propranolol (Figure A) and promethazine and quinidine (Figure B), are lipophilic and basic (high pK_a) amines which have excessive retention and poor peak symmetry on the fully coated Radial-PAK™ C_{18} column in an eluent of acetonitrile and aqueous dibasic ammonium phosphate (60:40). For these lipophilic bases, addition of higher salt concentration only slightly improved the separation on the Radial-PAK™ C_{18} column and retention volume was of the order of several hundred milliliters. This has caused many people to say "These compounds never elute from Radial-PAK™ C_{18}!"

However, under the "never elute" reversed-phase eluent conditions, the use of bare silica results in good peak symmetry (Figure below).

FIGURE A

1. Maleic Acid
2. Chlorpheniramine
3. Propranolol

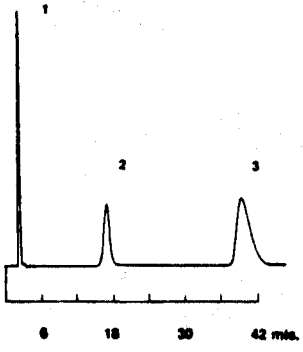
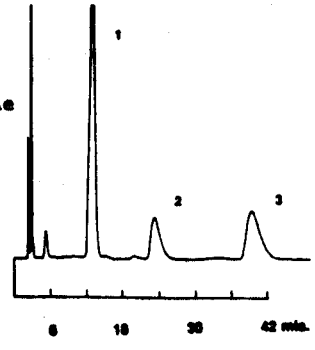


FIGURE B

1. Promethazine
2. Phenylpropanolamine
3. Quinidine



Mobile phase is acetonitrile/water (60:40) with 4 mM dibasic ammonium phosphate (pH 7.8).
Column: Radial-PAK™ Silica
Structures shown on back of page.

Clearly, this eluent was not optimized for the resolution of these lipophilic amines. It was developed to compare retnetion to Radial-PAK™ C_{18} under conditions where the basic compounds do not elute from the bonded phase cartridge. (See Analytical Chemistry (1982) 54, 442-447).

FIGURE A

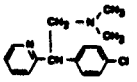
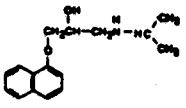
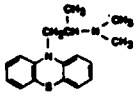
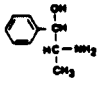
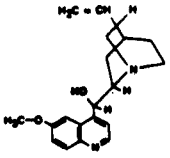
Name	pKa	Structure
MALEIC ACID		
CHLORPHENIRAMINE	8.9	
PROPRANOLOL	9.4	

FIGURE B

Name	pKa	Structure
PROMETHEZINE	9.1	
PHENYLPROPANOLAMINE	9.0	
QUINIDINE	8.3	

If one chose to optimize "reversed-phase" separations on bare silica gel (increase organic to decrease retention), the method offers benefits such as

- Price
- Simple Eluents
- Long Column Life
  (longer when using Guard-PAK™ Precolumn Inserts)

Dr. Robert Peoples of Lederle Laboratories has commented that a number of drug companies are now using this approach and that he has solved problems which he felt were not possible on bonded phase columns.

So, if you are dealing with organic amine samples which have excessive retention on bonded phase columns, they are good candidates for using bare silica with "reversed-phase" eluents.

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