Waters
Lab Highlights
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LITERATURE CORNER

SELECTIVE SEPARATION OF PHENOLIC COMPOUNDS ON μBONDAGEL™ COLUMNS

Adsorptive effects are generally considered to be something to avoid in size exclusion separations on silica-based columns such as the μBONDAGEL™ E-series. When aqueous eluents are used, the addition of various salts is often quite effective at eliminating adsorption and insuring that a pure size separation is achieved. In certain cases, a small percentage of alcohol is also added to the eluent to eliminate retention of non-polar compounds by a reversed-phase mechanism.

A recent report (1) demonstrates that adsorptive effects are not always bad news. Dr. T. Suortti of the Technical Research Center of Finland reports that phenolic constituents of a complex aqueous sample could be selectively retained using a μBONDAGEL™ E-125 column with an eluent consisting of 0.4% acetic acid in water. Apparently, the unique chemistry of the μBONDAGEL™ column results in class-specific retention of phenols. This is significant due to the increasing interest in phenols as priority pollutants.

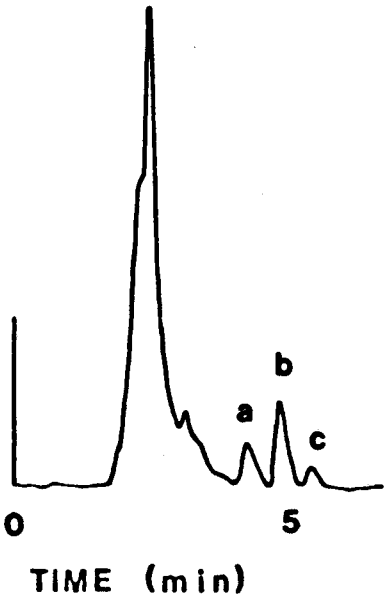

FIGURE 1. Chromatography of the collected antimicrobial fraction on a μBONDAGEL™ E-125 column. The eluent was 0.4% acetic acid in water at 2 ml/min flow rate. UV detection is at 254 nm (0.2 AUFS). (a = 3,4-dihydroxybenzaldehyde, b = 3,4-dihydroxyacetophenone, c = 4-methylcatechol)

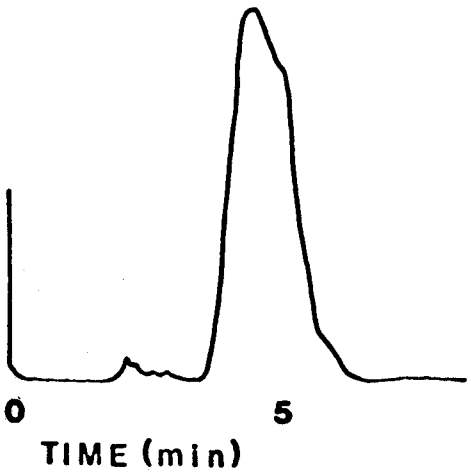

FIGURE 2. Isocratic chromatography of the collected antimicrobial fraction on a μBONDAPAK™ C_{18} column. The eluent was 15% methanol/84.6% water/0.4% acetic acid at a flow rate of 1 ml/min. UV detection as in Figure 1.

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Dr. Suortti's goal was the identification and quantitation of antimicrobial compounds which are formed during the heating of aqueous sugar solutions. The heated solutions were first fractionated by running a 0% to 100% water-methanol gradient on a μBONDAPAK™ C_{18} column. Both eluents contained 0.4% acetic acid. An appropriate fraction known to possess antimicrobial activity was collected and reanalyzed using a μBONDAGEL™ E-125 column. Figure 1 shows that although the majority of the reinjected sample eluted within the permeation volume of the column, three phenolic compounds were retained beyond the total inclusion volume (V_t). These were later identified as 3,4-dihydroxybenzaldehyde, 3,4-dihydroxyacetophenone and 4-methylcatechol. Similar results were observed with μBONDAGEL™ E-500 and E-1000 columns, but superior resolution was obtained with the E-125 material. An attempt to resolve the same fraction on a μBONDAPAK™ C_{18} column was unsuccessful, as Figure 2 indicates.

This creative use of μBONDAGEL™ columns should remind us that mixed-modal separations can be beneficial at times. While most of our customers will still prefer to adjust eluent composition to avoid adsorptive and reversed-phase effects, occasions may arise in which these same "unwanted" effects can be used to advantage.

1. T. Suortti, J. High Res. Chromatogr and Chromatogr. Comm., 6, 277 (1983).