C H E M I C A L • D A T A • S Y S T E M S

CDS Solutions

APPLICATIONS INFORMATION USING ADVANCED GC SAMPLE HANDLING TECHNOLOGY

Analytical Pyrolysis of Surfactants

Surfactants have long since been used by industry and society as a whole. With increasing environmental concern about the world's water supply, the analysis of water for solvents and other pollutants is becoming more and more essential. Volatile organic compounds are easily analyzed by purge and trap analysis of aqueous samples, however, there are still other pollutants which have a higher affinity for water and can't be liberated by this method. Surfactants are a group of pollutants which fit into this classification. In this case dynamic headspace and pyrolysis can be used to facilitate surfactant analysis.

There is a wide range of active agents within the general group of surfactants. Some surfactants are anionic, cationic or nonionic. Figures 1 and 2 show the use of dynamic headspace and pyrolysis respectively in the analysis of a cationic surfactant. The dynamic headspace chromatogram displays the solvents and fragrances which are liberated from the sample when it is heated to 200°C for 10 minutes. Having been stripped of the solvents, fragrances and water, only the higher boiling components remain. Upon pyrolysis at 750°C for 10 seconds, both qualitative and quantitative information can be obtained about the surfactant.

In this case the surfactant was

(Continued on back)

Figure 1

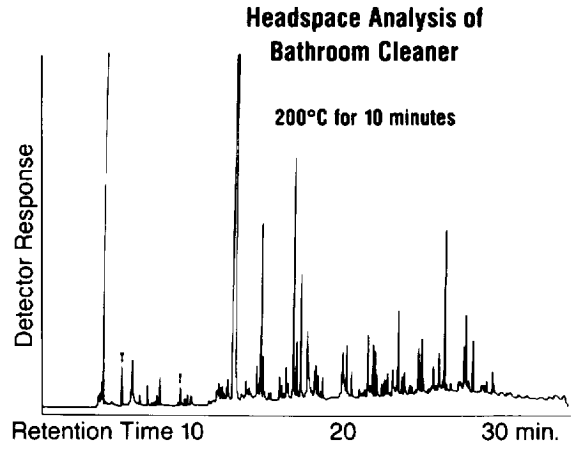
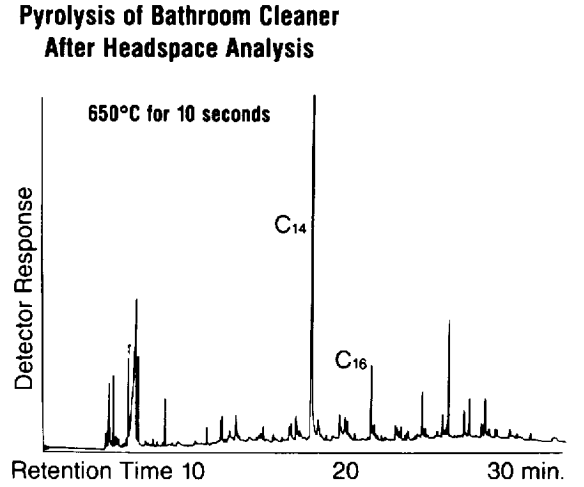


Figure 2



(Continued from front)

an n-alkyl dimethyl (benzyl and ethyl benzyl) ammonium chloride. The Alkyl groups were composed of n-$C_{12, 14, 16}$ & $_{18}$. From this pyrolysis, certain key peaks can be identified. Fragments containing n-C_{12}, n-C_{14}, n-C_{16} and n-C_{18} are observed while there are small amounts of benzene and ethyl benzene.

The presence of a high ratio of straight chain hydrocarbons to benzene or ethyl benzene indicates the increased bond stability due to the presence of the alkyl group. Thus the alkyl groups are preferentially cleaved. Dynamic headspace and pyrolysis can be seen as an informative method in the analysis of surfactants of all types. The fragmentation patterns generated upon pyrolysis will provide structural detail as well as quantitative data.

EQUIPMENT

DYNAMIC HEADSPACE AND PYROLYSIS

Pyroprobe 124 glass lined equipped with cryogenic refocuser at the injection port of the gas chromatograph
Desorption temperature: 200° for 10 minutes
Pyrolysis temperature: 750°C for 10 seconds
Interface temperature: 300°C
Cryogenic temperature: -100°C

GAS CHROMATOGRAPHY

Varian 3700 equipped with a flame ionization detector
Initial temperature: 40°C for 2 minutes
Ramp rate: 8°C/min. to 290°C
Column: 50m x 0.25mm SE-54 fused silica capillary
Carrier: Helium at 20 psi

For more information on this and related applications, we recommend the following readings:

Tsuge, S., Sugimura, Y., and Nagaya, T., *J. Appl. Anal. Pyrol.*, 1, 221-229 (1980).

Audisio, G., and Bajo, G., *Makromol. Chem.*, 176, 991-998 (1975).

Additional literature may be obtained from CDS by calling 1-800-541-6593 or in Pennsylvania 215-932-3636.

ABOUT CDS

CDS Instruments, a unit of Autoclave Engineers Inc., is a worldwide leader in the manufacture of instruments and equipment for research applications. With over 15 years of service to the research community, CDS is dedicated to the development of instrumentation for use in the preparation, separation and analysis of complex organics. We are also dedicated to providing researchers with the technical and applications information they need to perform their work efficiently. The purpose of CDSolutions is to supply the researcher with a constant stream of applications solutions for advanced GC sample handling. The article you just read is one of many available at no charge to our customers. For a complete list of topics, please write to our Technical Information Dept. in Oxford, Pennsylvania.

CDS INSTRUMENTS
A unit of Autoclave Engineers
• 7000 Limestone Rd., Oxford, PA 19363, U.S.A. • Phone: (215) 932-3636 • Telex: 83-5308