



Surfactants Congress Report

1990s will be an exciting decade

The following report on the 2nd World Surfactant Congress held in Paris, France, in May was prepared by Arno Cahn, JAOCS Associate Editor for News for Surfactants and Detergents.

In the 1950s and 1960s, international congresses on surface activity in various cities in Europe provided a forum for an exchange of information on surface activity among researchers from academe and industry. With the demise of the sponsoring organization, these congresses were discontinued. In 1984, CESIO, an association of surfactant manufacturers in Europe, stepped into the breach and organized the 1st World Surfactant Congress in Munich. This congress proved successful enough to warrant a repeat performance: the 2nd World Surfactant Congress, held May 24-27, 1988, in Paris with the motto "Surfactants in Our World—Today and Tomorrow."

The statistics are impressive: more than 1,100 participants from over 40 countries, four plenary lectures and over 120 papers presented in parallel sessions dealing with the economics of surfactants, their synthesis, structure and properties, applications in various technical areas and surfactants in the environment.

Plenary lectures

In the opening plenary lecture, P.

Sutherland discussed "The Role of Competitive Policy on the Way to 1992," a subject of particular interest and concern to European participants since a single European market is planned for 1992. A single market has important implications for the economies of individual countries as individual segments then will face untrammelled competition from other countries in the European Economic Community (EEC).

Fears of massive local unemployment are real and must be dealt with in the Council of Europe, Sutherland said, noting that some merger control regulation appears needed to oversee cross-border operations. Government aid to industry segments and, worse, to firms distorts the market and its competitive forces. However, governmental assistance in training and retraining, in research and development, and in dealing with redundancies is appropriate. For a truly single European market, legal harmonization and tax harmonization among the individual countries also will be important. Predicting many obstacles will need to be overcome before 1992, Sutherland said he is convinced the political will exists for the achievement of a single European market.

H.J. Richtler of Henkel KGaA, speaking on "World Prospects for Surfactants," reviewed consumption trends worldwide, trends that may influence surfactant consumption and price developments for in-

termediates. He forecast economic growth of about 3% for the 1987-92 period worldwide, with Western Europe and the U.S. at 2.5%, Japan at 3% and the developing countries at 3.5%. Population growth in Western Europe and Japan will be essentially stagnant. For the U.S., population growth is estimated at 1% while the developing countries will sustain 2% growth.

Surfactant consumption is affected by several demographic trends that individually can run counter to each other. The link between gross national product (GNP) and surfactant demand is stronger, the lower the income. For the Western societies, demographic trends include the growth of older populations, an increasing number of smaller families, more dining out as a result of increasing household incomes, an increase in the number of one-member families, more women in the work force, more leisure time and heightened hygienic consciousness. In response to these trends, the heavy-duty detergent market has reacted with increasing market shares of heavy-duty liquids, the appearance of softergents and other multifunctional products, the appearance of pre-measured products and, in Europe, a tendency toward higher density formulations. Many of these products, according to Richtler, are conceived as line extensions of existing brands. In the U.S., he noted, 25 versions of a very well-known brand are in various test markets.

Discussing market shares and consumption volumes of surfactants in household and personal care consumer products and in various industry segments, Richtler reported total surfactant consumption volumes for the Western countries and Japan. In 1987, 984,000 metric tons (MT) of linear alkylbenzenesulfonates (LAS), 350,000 MT of alcohol ether sulfates (AES), 236,000 MT of alcohol sulfates (AS), 467,000 MT of alcohol ethoxylates, 385,000 MT of alkylphenol ethoxylates and 1,470,000 MT of soap, 60% of which went into per-

tively motivated debate of the virtues of "natural" versus "synthetic" (oleochemical versus petrochemical) routes to surfactant production. This debate continued throughout the congress to the final summaries by section chairmen. There, the diplomatic view expressed was that the two approaches are complementary rather than competitive.

It fell to John Burford of ICI of the United Kingdom (U.K.) to represent the "synthetic" forces in his plenary address on the "The Evolution of Surfactants for the

of Pressindustria noted that fatty acids and fatty alcohols will figure prominently. Their production by biochemical processes is a distinct possibility in the future. Even ethylene oxide is a candidate for a biochemical route starting with ethanol produced by fermentation.

Straneo envisaged continuous production plants of capacities of 50,000-300,000 tons/year for producing nonionic surfactants with 6-10 moles of ethylene oxide from conventional petrochemical sources. In principle, such large capacity installations are possible today. Market demands, however, have not yet reached this level. Such plants will produce only the highest quality product, with elimination of even traces of dioxane and with a narrow ethylene oxide distribution. The latter, Straneo explained, could be achieved by introducing continuous stripping and recycling stages into the process. Environmental problems will need to be taken into account in these plants. To minimize environmental problems, he said it is possible on a macro-scale to conceive of the concentration of production of ethylene oxide and of nonionic surfactants in certain geographical regions.

R. Cabridenc of IRCHA presented a governmental view of the importance of biodegradation as an essential predictor of pollution by surface active agents. He noted that for the past 25 years, surfactant biodegradability has been the subject of consideration on an international scale. Research has been conducted with the aim of better understanding microorganisms involved, the conditions for biodegradability and biochemical mechanisms.

Major effort has centered on laboratory modeling of varying sophistication and varying degree of realism. Methods for assessing primary biodegradation of surfactants have been established and endorsed on an international level. Other methods give information on ultimate biodegradability, on the adaptation of the microflora and on possible aquatic toxicity effects of the metabolites formed. Like all laboratory methods that deal with biological processes, these methods are

Raw material prices and availability are not expected to change dramatically until 1990.

sonal toilet bars, were used. Growth rate for each of these surfactant types ranges from 0-2.5% average annual increase, with alkylphenol ethoxylates at the lower end and LAS, AES and alcohol ethoxylates at the upper end.

Future surfactant use for consumer products will be affected by concern for the environment, by voluntary actions from consumers and industry, and by governmental regulations. Richtler cited examples of regulations and experimental approaches in both product formulation and washing machine construction as evidence of initiatives to decrease consumption of detergents and hence their contribution to the burden on the environment.

Raw material prices and availability are not expected to change dramatically until 1990. Natural fatty alcohols, according to Richtler, enjoy good prospects because they are widely available and are currently underused.

Richtler's talk was followed by a Henkel-produced film extolling the future prospects of "natural" surfactants derived from oleochemical sources. The talk and film set the stage for a somewhat competi-

1990s." Not all things natural are beneficial, he noted, pointing to natural toxins as evidence. The future direction of domestic detergency, he said, will be strongly influenced by multinational surfactant manufacturers and detergent producers. That direction also will be influenced by the increasing awareness in Western societies of man's impact on the environment. When awareness is based on emotion rather than on scientific fact, changes may be made for the wrong reasons. Energy savings, greater safety in production, as well as improvements in the cost/performance ratio, however, are desirable goals.

According to Burford, future surfactant products will be aimed at solving specific technical problems, particularly for the pharmaceutical, food, textile and agricultural industries in which effect outweighs cost. Synergistic efficacy between surfactants and other additives will play an important role in this development. The 1990s, Burford said, will be an exciting decade for surfactants.

Reviewing new processes and raw materials for the production of nonionic surfactants, P. Straneo

not entirely satisfactory; they cannot totally mirror the natural conditions—the precise standardization of the protocol is difficult and reproducibility often falls short. Nonetheless, these methods are useful in that they help limit environmental nuisances. While certain aspects of the methodology of biodegradation remain to be researched, the ongoing work augurs well for the discovery of solutions permitting the marketing of more efficient products with minimal impact on the environment.

The following are highlights from the 124 papers presented in the five sections at the congress.

Surfactant economics

This section included six papers. In the first, Ron Bryan of Vista Chemical considered the "Future of Anionic Surfactants." Worldwide demand for anionic surfactants includes 1,950 million MT of LAS; 620,000 MT of branched alkylbenzene sulfonates (ABS); 490,000 MT of AES; 180,000 MT of AS; 70,000 MT of paraffin sulfonates (secondary alkanesulfonates); and 40,000 MT of alpha-olefinsulfonates, Bryan said. He then discussed the possible impact of surfactant production from natural sources on the future of anionics. Such effects include a competitive advantage for natural oils, rising production and capacity, and the possible expansion of naturally derived surfactants such as methyl ester sulfonate (MES). He concluded that although natural oil prices generally have stabilized, production economics for their surfactant derivatives—and indeed for any new large-scale use surfactant—are unfavorable and will restrict effective competition with the current "workhorse" surfactants produced in large volumes in fully amortized plants.

Substantially, the same conclusions were echoed by D. Carlotti of Shell Chemicals, U.K., who spoke on "Detergent Intermediates from Petroleum—A Natural Choice," a title which playfully alluded to the natural vs. synthetic debate mentioned earlier. He predicted ethylene prices to be within an affordable range until the year 2000 and

beyond. Ethylene will be available from petroleum feedstocks or from competing and even more abundant feedstocks such as gas and coal, he noted. A stable future and advanced technology for the production of high-purity linear molecules support the assertion in the title of his paper.

W.J. Struyck of Unichema International, speaking on "Features of Oleochemicals," predicted a rosier future for oleochemicals. Oleochemical raw materials are abundantly available from renewable resources. Conversion to surfactant intermediates requires significantly less energy than conversion of the corresponding petrochemicals, he noted. Processing methods have improved over the years, resulting in improved quality at no cost increase.

Consumer habits, environmental issues, associated legislative actions and favorable economics favor the expansion of oleochemically derived surfactants, according to Struyck. Also, the promise of biotechnology foretells the development of superior and totally new products. Even without sophisticated biotechnology, more conventional approaches now focus on developing nontraditional oil crops such as cuphea and crambe.

J.I. Roes and S. de Groot of Akzo Chemicals provided an assessment of the "Economic Importance of Cationic Surfactants." In 1987, Western Europe (U.S. figures in parentheses) was estimated to have used 150,000 MT (190,000 MT) of cationics, with 48% (42%) going to softeners and detergents; 11% (16%) going into mineral and oil processing; 11% (9%) going into textiles; 8% (8%) going into road chemicals; 7% (6%) going into biocides; and 15% (19%) used in miscellaneous applications.

In the U.S., cationics occupy third place in volume (8%), after anionics (63%) and nonionics (29%). In terms of value, however, the distribution is more balanced with anionics at 39%, nonionics at 29% and cationics at 32%. Cationics, at an estimated 4-5% growth rate a year, are growing faster than the other two surfactant types and are expected to grow at that rate in the future provided fatty acids con-

tinue to be available at attractive prices.

Anticipation of these growth rates are counterbalanced by environmental concerns. Some experiments suggest that cationics are toxic to fish. However, the natural environment contains an excess of anionic surfactants that would be expected to ameliorate any adverse reaction from cationics. More testing is needed to determine the real impact of cationics on the ecosystem, Roes and de Groot said.

In a talk entitled "The Economic Importance of Surfactants in Textile Treatment," O. Smerz of Hoechst AG examined the role of surfactants at each stage of textile manufacture from fiber production to spinning, sizing, weaving, pretreating, dyeing and finishing. Surfactants, predominantly nonionics, are involved at each stage. In the manufacture of polyester filaments, formulations of auxiliaries can be complicated, consisting of about 50% mineral or ester oil and 50% a surfactant mixture containing up to six different components. In the dyeing step, the ratio of surfactant to dye can be as high as 1:1. Citing projections of increased textile demand in the future, Smerz estimated 570,000 MT of surfactants will be used in textile treatment by the year 1994.

Surfactant raw materials

J.G. Moffett of Shell Chemical, reviewing "Detergent Alcohol Surfactants—A Growing Role in the U.S.," noted that these materials have shown an average annual growth rate of 3% in the decade following 1976. Despite potential competitive challenges, Moffett predicted continued growth and applications of detergent-range alcohol surfactants because of their favorable cost/performance attributes and the introduction of new variants, such as single-chain length alcohols and narrow-range ethoxylates.

Alkylpolyglycosides (APG) also were the subject of several papers in well-attended sessions. In a talk entitled "Alkylpolyglycosides—A Timely Answer to Raw Material Shortages and Ecological Discussion," P. Hoffmann of Huels

presented his view of APG as a surfactant satisfying both ecological and economic requirements. High biodegradability and acceptable safety data were the basis for the former; for the latter, Hoffmann pointed to generally stable raw material pricing during the past 15 years, when crude oil prices exhibited wild swings. Since raw material costs make up about 50% of the cost of a surfactant and since the production process contains fewer steps than that for LAS, Hoffmann said APG represent a viable candidate for the surfactant market.

with increasing linearity of the alkyl chain, but increase with increasing $\text{SO}_3/\text{organic}$ ratios. Other factors, too, affect dioxane levels; for example, residual water content in the base nonionic leads to more dioxane formation, as does the presence of PEG (which also calls for higher $\text{SO}_3/\text{organic}$ ratios) and extended storage times between sulfonation and neutralization of the resulting ether sulfonic acid. The presence of unsulfated matter correlates with lower dioxane content. Greater dilution of SO_3 with air similarly depresses dioxane formation. According to Moretti, minimizing

and Properties of Alkyl Polyglycosides," using butyl oligoglycoside as an intermediate in a two-stage process. The cmc values of APG, both of the pure alkyl β -D-glucosides as well as those of the technical products, decrease with increasing alkyl chain lengths, in analogy with alcohol ethoxylates and alcohol sulfates. In contrast, the surface area of the pure compounds is somewhat smaller than that of alcohol sulfates, while the surface area of the technical mixture is slightly larger. APG show an unusual salt tolerance behavior. The volume V_m of the middle-phase microemulsion is high and relatively constant over a large range of salinities and temperatures. In this respect, APG differ markedly from other surfactants. These characteristics, Lueders suggested, make APG suitable candidates for application in surfactant-flooding enhanced oil recovery operations.

In one of several papers dealing with the production of surfactants by biosynthesis, F. Wagner of the Technical University, Braunschweig, reported on "Nonionic and Anionic Biosurfactants: Microbial Production, Structure and Physico-Chemical Properties." Microbial biosynthesis of surfactants, Wagner reported, can proceed from raw materials, such as mono-, oligo- and polysaccharides, triglycerides, fatty acids, hydrocarbons and glycerol. Overproduction of biosurfactants by resting or immobilized cells is accomplished by growth limitation, e.g., limiting nitrogen as a nutrient.

Lipopeptides, lipopolysaccharides and glycolipids are examples of biosurfactants. In glycolipids, mono- and oligosaccharides constitute the hydrophilic moiety. Hydrophobicity is provided by branched or straight-chain fatty acids with or without double bonds, of chain lengths C_2 to C_{36} . The two moieties are linked by an ester or glycoside bond, the latter made possible by the presence of a hydroxyl-substituted fatty acid. Such compounds are known to be effective surfactants. They reduce the surface tension to 25-36 mN/m and the interfacial tension against n-hexadecane to values below 1 mN/m. In the discussion following his

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J. Thiem and coworkers of the University of Muenster reported on the "Synthesis and Properties of New Surfactants from Carbohydrates." The fine structure of the final APG is affected by the conditions of the alkylation step. Choices here include catalysis by protons (the Fischer synthesis), the Koenigs-Knorr route via formation of an intermediate penta-acetate and Lewis acid-catalyzed glycosylation. Not surprisingly, surface properties, such as the critical micelle concentration, are more strongly affected by the length of the alkyl group than by detailed structural variations in the glycosidic head group. Derivatives were prepared by operating on the hydroxymethyl group, including oxidation to form the corresponding carboxylic acid, sulfation with SO_3 in pyridine to form sulfates and amination via tosylation to form a tertiary amine.

"Sulfation of Ethoxylated Alcohols in Multiple Tube Reactors" was the topic presented by G.F. Moretti of Ballestra. Low 1,4-dioxane levels in the finished product were the aim of the experimental work reported. According to Moretti, dioxane levels decrease

dioxane under practical conditions requires a careful balancing of raw material quality and processing conditions.

Synthesis, Structure and Properties

Replacement of a halide by $-\text{SO}_3$ group using an Na_2SO_3 reagent is an established synthetic route known as the Strecker Reaction. N.J. Stewart of British Petroleum, in his paper "Alkyl/Alkylaryl Ethoxyethanesulfonate Synthesis: Rate Enhancement of the Strecker Reaction," disclosed the beneficial effects of substituting K_2SO_3 for the sodium salt; an overall six-fold increase in space-time yield was achieved compared to an optimized Na_2SO_3 process. Surfactants, such as $\text{R}(\text{OCH}_2\text{CH}_2)_n\text{SO}_3\text{Na}$ produced by this reaction, can survive harsh chemical environments and hold particular promise for use in enhanced oil recovery by surfactant flooding, where stability to temperature over a period of years and tolerance to high salinity and calcium ions are of fundamental importance.

In a third paper on APG, H. Lueders of Huels described the "Synthesis, Chemical Structures

presentation, Wagner provided some hypothetical cost figures for production of biosurfactants; he noted that in principle, costs are not entirely prohibitive although much scale-up work is needed.

Surfactant applications

L. Cohen of Petresa reported on the "Synthesis of a Novel LAB (Linear Alkylbenzene) as Raw Material for Liquid Detergent Formulations." His data showed that in a series of sulfonates, a sulfonate derived from a LAB of nearly equal distribution of C₁₀, C₁₁ and C₁₂ chain lengths produced formulated light-duty liquids with good foam stability, lower viscosity and higher cloud points than those made from sulfonates with a less-balanced chain length distribution. These products generally exhibited higher foam levels and washed more dishes than formulations derived from the other sulfonates in the series, he said. The sulfonate also appeared to be less affected by water hardness than current commercial products.

Also in connection with light-duty liquids, T. Matson of Vista, speaking on "Effects of Soil on Foam Stability Performance of Dishwashing Liquids," highlighted the role of test soil in evaluating the performance of different surfactants. Three different test soils showed three different products to be superior on each of the test soils. A similar dependence on soil type was shown when products based on LAS, alpha-olefinsulfonate (AOS) and paraffinsulfonate (SAS) were rated by four different laboratories. The demonstration of synergism between two components—LAS and alcohol ether sulfate, for instance—also was found to depend on the test soil used. Soils based on shortening appear to bring out this synergism, while other soils do not show it at all or less strongly, Matson said. He concluded that it is important for the evaluator to understand all performance variables, including concentration, hardness, soil load, ionic strength and foam stabilizer effects.

M. Murata of Kao Corp. spoke on "A New Detergency Mechanism Based on Alkaline Cellulase." According to Murata, the working hy-

pothesis for the effect of alkaline cellulase is that it attacks cellulose molecules in the interlamellar regions of the fiber-carrying bound water. As a result, conventional detergent compositions are enabled to remove soil held there. Support for this hypothesis was provided by data showing that the level of bound water in cotton garments decreased with exposure to increasing concentrations of cellulase. The beneficial effect of alkaline cellulase was demonstrated in repeat washing tests of naturally soiled underwear at 20° C. With an in-

tested: tetraacetylglucouril (TAGU) and tetraacetythylenediamine (TAED). After 70 minutes, however, TAED had released more AO than TAGU and ISONOBS and more than three peroxyacids that also were investigated. Actual laundry tests on tea stains confirmed these findings for the series of activators.

Experiments with a two-phase oil/water system showed that the long-chain activator ISONOBS migrates into the oil phase where it is relatively stable. Peracetic acid, formed from TAED and sodium per-

Lipopeptides, lipopolysaccharides and glycolipids are examples of biosurfactants.

creasing number of wash cycles, the relative cleanliness evaluated visually increased while residual sebum soil on the garments decreased. Purified alkaline cellulase, derived from *Bacillus* sp. KSM-1001, proved more compatible with detergent ingredients than conventional cellulases. Its optimum pH was reported to be 9, with optimum temperature around 40° C.

Speaking on "Comparison of Efficacy of Various Peroxygen Bleach Systems Under Laundry Conditions," H. Endo of Hoechst AG addressed the rate of generation of active oxygen (AO) and the distribution of released active oxygen between the water and oil phase. As is well known, evolution of AO from perborate without activator is highly temperature-dependent. Not surprisingly, the Arrhenius plot for this reaction yielded a large activation energy of 53 kcal/mole. The rate of AO evolution is enhanced by the presence of activators. Under simulated wash-cycle conditions at 30° C and 60° C, Isononanoyloxybenzenesulfonate (ISONOBS) released more AO during the first five minutes than the other activators

borate, remains in the water phase. Unlike ISONOBS, the decomposition rate of TAED does not decrease in the presence of increasing amounts of oil. When a bleachable colorant, carotin, was added to the oil phase, ISONOBS decomposed with second-order kinetics, first-order in each of the reactants with a calculated activation energy of 12 kcal/mol. In confirmatory laundry experiments with carotin-in-oil-stained soil swatches, ISONOBS produced generally superior stain-removal results on polyester and cotton/polyester fabrics.

The beneficial effects of polymeric additives in rinse-aid formulations were outlined by P. Zini of Rohm & Haas in his paper on "Nonionic Surfactants and Anionic Polymers for Improved Hard Surface Rinsing Characteristics." The contribution of polymers to good rinsing is due to their adsorption on the substrate (glass) and consequent reduction of the contact angle between the substrate surface and water. In the final rinsing stage, this contact-angle reduction complements the reduction accomplished by surfactants that oper-

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ate at the substrate surface/air interface. The result, Zini said, is improved spreading of water just prior to drying with a lessened tendency toward drop formation and, hence, toward spotting. Zini provided several examples of formulated rinse aids for use under alkaline and acid conditions.

Surfactants in the environment

A paper by W.J.W. Pape and Udo Hoppe of Beiersdorf on the "Evaluation of Acute Irritation Potentials of Tensides Using the in vitro Al-

ternative Red Blood Cell Test System" were reviewed by W.P. Meier of Procter & Gamble (P&G). In connection with the notions of "practical" biodegradability and "environmentally-relevant" time frames, Meier discussed the relationship between biodegradation half-life (BHL) and residence time (RT). His data showed that at a BHL/RT ratio of about 0.1, removal is essentially complete and only less than 0.1% of the material remains. At BHL/RT ratios of 7 or greater, less than 10% of removal is due to biodegradation.

In its new biodegradation labo-

levels were reduced from greater than 200 to less than 2 ug/g. According to Meier, the results indicate that considerable biodegradation activity may reside in nonsewage environmental compartments, such as surface and subsurface soils, sediments, ground water and periphyton, so that rates of degradation are rapid and result in substantial removal of surfactants from these environments.

A paper on "Practical Investigations and Theoretical Considerations of Judgment on Safety of Surfactants," prepared by W. E. Parish of Unilever and delivered by M. Howe, reviewed the extensive list of stringent tests of human safety and environmental acceptability which precedes clearance of surfactant-based consumer products. That such test regimens are effective is supported by the scarcity of adverse effects among consumers despite universal and repeated daily use of such products.

Of necessity, this article can cover only a highly selective summary of the papers presented. Large sections of the program, such as papers on the physical behavior of surfactants in solution, had to be passed over because of the parallel-session format of the congress. Overall, the meeting was an impressive undertaking that succeeded in its goals. Importantly for the European majority of participants, the meeting included discussions of environmental issues.

A Third World Surfactant Congress is planned for 1992 in the United Kingdom.

Measurements on the discharge from a local laundromat have shown rapid biodegradation of LAS.

ternative Red Blood Cell Test System" attested to the current interest in finding nonanimal tests for assessing skin and eye irritation. The in vitro approach presented here employed the reaction of red blood cells (RBC) with anionic, amphoteric and nonionic surfactants. Experimentally, RBC suspensions with a fixed oxyhemoglobin concentration were incubated for 10 minutes with increasing surfactant concentrations. After dilution, incubation was terminated by high-speed centrifuging and the resulting supernatant was monitored photometrically at 530 or 560 nm against a blank and a control. With total hemoglobin release (cell lysis) set at 100%, the effective dose to cause 50% cell damage, H_{50} , was then determined. In a separate assay, a denaturation index (DI) was determined on hemoglobin. For a series of 16 surfactant types, a good inverse correlation was found between H_{50} and DI. Correlation with in vivo data was good enough to suggest the RBC method as a candidate alternative to animal testing.

"Contemporary Approaches for Evaluating the Biodegradability of Surfactants in Environmental

ratory, P&G has constructed a laboratory model stream, a serpentine fiber glass channel 22 m long and 32 cm wide with a water depth of about 23 cm. With C^{14} labeling at critical points in the molecular structure, the molecular biodegradation of surfactants can be followed with ease and precision over experimental periods of months and years.

In a second approach to biodegradability measurements, experiments with in situ bioassay chambers, that can be immersed into environmental compartments of interest, were used to measure the response of epilithic microbial communities. For a linear alcohol ethoxylate, biodegradation rates were rapid with half-lives of 3-50 hours. Half-lives were dose-responsive, with higher levels showing more rapid biodegradation.

Measurements under actual field conditions represent a third and important approach to biodegradability testing. Measurements on the discharge from a local laundromat have shown rapid biodegradation of LAS. Half-lives were determined at varying subsurface soil depths and, under these "worst case" conditions, ranged from 3-16 days. Within a depth of 2.5 m, LAS

Sherex expands

Sherex Chemical Co. Inc. has announced plans to construct a multipurpose fatty alcohol plant with capacity to produce 60,000 metric tons (MT) a year.

Although no site has been chosen, the company is considering its current oleochemical manufacturing sites at Mapleton, Illinois, and Janesville, Wisconsin, and its resin plant location at Lakeland, Florida.

The unit will use a new process to manufacture unsaturated and

saturated fatty alcohols based on methyl esters as feedstock. This process will replace Sherex's current technology. Lurgi is preparing the preconstruction engineering plan.

The fatty alcohol plant, estimated to cost \$50 million, is scheduled to come on stream in early 1991.

LAB capacity

Vista Chemical Co. has increased its linear alkylbenzene (LAB) capacity by 12% due to the completion of several projects designed to improve product quality and plant efficiency.

According to Vista, production capacity has increased from 235 million pounds to 260 million pounds at its Baltimore production plant and from 150 million pounds to 170 million pounds at its Lake Charles, Louisiana, LAB plant.

"The increases are due to many incremental improvements in operating efficiency," according to Jan Vogel, Vista's vice president for surfactants. He noted that several other quality and efficiency projects now under way will increase LAB capacity by an additional 60 million pounds in 1989, to bring the company's total LAB capacity to 490 million pounds.

Solvents market

The toiletries/perfumery segment shows the strongest growth in Western Europe's organic industrial solvents market, according to a study conducted by Frost & Sullivan.

The study, "The European Market for Industrial Solvents," noted that this segment is growing 1.2% a year, the highest growth rate of any end-use segment.

The study found that the increasing use of both specialty chemicals and oxygenated solvents means higher prices. For Western Europe, industrial solvent revenue is predicted to exceed \$2.74 billion in 1988 and reach \$3 billion in 1991. Total consumption, however, is expected to decline to 5,290,000 tons

in 1991, from 5,421,000 tons in 1988.

According to the study, intense environmental and legislative pressures, particularly on aliphatic and aromatic hydrocarbon solvents and on chlorinated solvents, are hurting the market. Toiletries use mainly alcohol-based solvents in the less environmentally hazardous oxygenated-solvents group.

Section news

The Surfactants and Detergents Section of AOCs met May 10, 1988, in Phoenix, Arizona, in conjunction with the 1988 AOCs annual meeting.

Section officers are Arno Cahn, chairman; Ted P. Matson, vice chairman; and Wayne J. Stancel, secretary-treasurer. Three members-at-large are Karl T. Zilch, Paul Sosis and George C. Feighner.

The section appointed volunteers to serve on committees for program planning, membership, publications and education. Committees and those appointed are the following:

- Program planning—David Sharer, chairman; Jerry Collins and Jesse Lynn. This committee will work in conjunction with the AOCs National Program Planning Committee to develop programs for various symposia on surfactants.

- Membership—Ken Shoene, Rick Bertozzi and Sid Clark.

- Publications—John Scamehorn, chairman; Tom Christ and Arno Cahn. This committee will establish procedures for prompt review of symposia and meeting papers to speed their publication as news articles or reviewed papers. Committee members also will review the instructions to authors and the timetable for manuscript preparation.

- Education—Paul Sosis, chairman; Milt Rosen, John Scamehorn and Irv Schmolka. This committee will develop short courses and symposia to promote the interchange of surfactant knowledge. It will work in conjunction with the AOCs Education Program Planning Committee.

Other discussion at the meet-

ing centered on improving the procedure for manuscript publication in order to increase the number of papers published in the Surfactants & Detergents section of *JAOCs*.

APAG update

Terry A. Spybey, elected to a two-year term as president of the European Association of Fatty Acid Producing Companies (APAG), told the group's 13th general assembly that conditions may be improving for the industry.

Spybey said competition from fatty acid imports, a major problem during the past two years along with falling glycerine prices, has been stopped due to European Commission action to establish import taxes. Also, the growth of heavy-duty liquid detergents has increased fatty acid demand.

Spybey, a director of Procter & Gamble Ltd. (P&G), is a past chairman of the United Kingdom Glycerine Producers Association and the APAG Glycerine Committee. He joined P&G in 1957.

1989 meeting

The XX Meeting of CED/AID on Surfactants will be held March 8-10, 1989, in Barcelona, Spain. Organizers are the Asociación de Investigación de la Industria Española de Detergentes, Tensioactivos y Afines (AID) and the Comité Español de la Detergencia (CED).

The technical program will feature talks on synthesis and analysis, physical chemistry, new developments and applications, and the environment. Those wishing to speak must submit abstracts in English or Spanish by Sept. 30, 1988.

The meeting will include simultaneous translation in Spanish and English.

For more information, contact the Secretaría de la Asociación de Investigación de Detergentes (AID), Jorge Girona Salgado 18-26, 08034 Barcelona, Spain, telex 97977 IDEB E, or telefax 204 59 04.

PQ acquisitions

The PQ Corp., manufacturer of silica-based industrial and specialty chemicals, has formed an Acquisition Core Group to oversee the company's acquisitions effort. This action follows a corporate decision to place more emphasis on the value of acquisitions in the company's growth and diversification.

The group, led by Dale J. Shimer, executive vice president, is charged with advancing the company's growth plans. It will identify and evaluate potential partnerships with other firms in related products and markets on a worldwide basis.

In other company news, John H. Cobb has been named vice president and plant manager of Spherical Products Corp., a subsidiary of the PQ Corp., Chattanooga, Tennessee. Also, Howard S. Sherry has been named general manager of Zeolyst Enterprises, a joint venture of PQ Corp. and Shell Polymers and Catalysts Enterprises Inc.

No joint venture

The French subsidiaries of Henkel KGaA and Colgate-Palmolive have broken off their planned joint venture that would have made the two detergent producers 50-50 owners of Cotelte SA.

Under the initial agreement, Henkel would have marketed liquid soaps, fabric softeners and household cleaners, while Colgate would have handled soap, bleaches and window products. However, the French Cartel Commission, investigating the proposed union, said it would infringe on monopoly laws. The venture ultimately would have given Henkel and Colgate control of nearly 75% of the market in some segments.

Now, under new terms, Henkel will sell nearly half of Cotelte to Colgate-Palmolive. Colgate will acquire the company's detergent and bleaching line which makes up two of Cotelte's three production plants. Henkel will take over Cotelte's household cleaning products.

Meanwhile, Colgate-Palmolive France has acquired a 33% stake in Societe Industrielle de Detergents d'Approvisionnement et d'Applications Chimiques (Sidac). The Libreville, Gabon, contract manufacturer packages both liquid and powder detergents.

SCS officers

The Society of Cosmetic Scientists has elected Angela Janousek of Kolmar Cosmetics U.K. as its president for 1988/89.

Other officers are S.E.M. Pearce of PFW Ltd., vice president; D.F. Williams of Max Factor & Co., secretary; and G.E. Taylor of Thomas Christy Ltd., treasurer. R.G. Harrison of Firmenich is immediate past president.

Council members elected are M. Grievson of Creations Aromatiques, M. Lawton of CTPA, A.K. Puri of Crestol Ltd., and A. Raybould of S. Black Ltd. Continuing as council members are V.H. Hyde of L'Oreal Ltd., A.J. Jouhar of ITI Transfer International, J.L. Knowlton of Johnson & Johnson, A.M. Lock of Gilchrist & Soames, and A.J. Tyler of Peter Black Pava Ltd.

Colors banned

The U.S. Food and Drug Administration (FDA) said it will ban further use of red dyes 8, 9 and 19 and orange dye 17 as color additives in cosmetics and drugs. The ban was to go into effect July 15, 1988.

The FDA decision came after several court rulings, including one by the Supreme Court, went against the agency.

Industry spokesmen said the ban will have minimal impact on the industry, because most firms have available substitutes for the four dyes. However, cosmetics and fragrance manufacturers were disappointed, noting the risk to humans exposed to the dyes is negligible. The Public Citizen Health Research Group had sought the ban, because studies had linked the dyes with cancer in laboratory animals.

Quats testing

The Chemical Specialties Manufacturers Association (CSMA) said a new pesticide ingredient review group will be formed to address the testing requirements on two sets of quaternary ammonium compounds recommended for priority consideration for test rule development under the Toxic Substances Control Act (TSCA) by the federal government.

The two quat groups, imidazolium (IQAC) and ethoxylated (EQAC), are used mainly in fabric softeners.

In a report to the Environmental Protection Agency (EPA), the TSCA interagency testing committee recommended chronic toxicity studies be performed to evaluate potential effects through long-term dermal exposure to the two quats.

News briefs

Henkel KGaA of West Germany has announced it will expand its worldwide capacity for natural fatty alcohols to more than 250,000 metric tons (MT) per year. New projects include a plant of 30,000-MT-a-year capacity in the U.S. and another in Malaysia. The two will use new reactor and catalyst technology Henkel has developed, allowing direct one-step hydrogenation of triglycerides to high-quality fatty alcohols.

Kao Corp. of Japan currently is marketing its Sofina brand of cosmetics in France and Spain. Sold in department stores in both countries, the products are exported from Japan; Kao, however, plans to manufacture them in France and Spain.

Procter & Gamble is test marketing two products: "Bold" washer-dryer packs, a detergent and fabric softener, and "Comet" chlorine bleach.

TG Birac of Yugoslavia is doubling its capacity to produce zeolite powder for the detergent industry. The

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company has announced plans to increase capacity to 200,000 MT per year by the end of 1988.

Hoechst Holland has announced plans for a 10,000-MT-per-year plant to produce tetraacetyl ethylenediamine (TAED) at its Vlissingen complex. Plant start-up is scheduled for early 1989. TAED is growing rapidly in Europe as a booster for perborate bleaches, allowing them to work at lower temperatures.

Nelson F. Borys has been promoted to manager of product development for the surfactant business group of **Staley Continental Inc.'s Horizon Chemical Division**. He formerly was product manager of surfactants. Also, **Richard A. Winstanley** has been promoted to manager of marketing and sales for the surfactant business group and **Robert L.**

Klein has been named manager of process development.

PPG Industries' Mazer Chemicals Division has introduced two new forms of its "Jordpon" CI surfactant, as well as a low foam surfactant aimed at the market for residential and commercial automatic dishwashing liquids.

Pilot Chemical Co. and American Cyanamid Co. have entered into a joint agreement to manufacture and market dodecyl diphenyl disulfonate, a specialty surfactant new to the emulsion polymerization industry. Also, Pilot has introduced a line of heavy-duty surfactants called "Calfax."

Dow Quimica Argentina SA, a Dow subsidiary in Argentina, and **Ultra's group in Brazil** said they are forming a 50/50 joint venture for

the production and commercialization of ethoxylated products in Argentina.

Reichhold Chemicals Inc. has formed a Coating Polymers & Resins Division out of the former Newport and Chemical Coatings divisions. One of the division's first acts was to announce start-up of its modernized 80-million-pound-per-year coating-resins plant in Chicago, Illinois. The new division has headquarters in Pensacola, Florida.

Arncliffe Manchester Ventures, marketer of beauty aids and proprietary-line fragrances in the U.S., has signed an agreement with Britain's **Fisher Pharmaceuticals Ltd.** to have exclusive U.S. distribution rights to "Polydine," a patented skin-cleansing bar.

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Book review

Detergents and Textile Washing: Principles and Practice, by G. Jakobi and L. Lohr (VCH Publishers Inc., 220 E. 23rd St., Suite 909, New York, NY 10010, 1987, 248 pp., \$59.95).

This outstanding monograph is based on a chapter entitled "Detergents" in **Ullmann's Encyclopedia of Industrial Chemistry**. In a mere 248 pages, it succinctly and authoritatively covers the current status of all important aspects of detergents and washing, from theory to economic and legal topics.

After a short historical review, the authors discuss the theory of the washing process, reviewing with exceptional clarity the phenomena underlying the detergent process. Following this is a detailed discussion of detergent ingredients. This includes not only surfactants and builders, but all of the components of a fully formulated deter-

gent, such as bleaches and bleach activators, enzymes, antiredeposition agents, foam regulators, corrosion inhibitors, fluorescent whitening agents, fragrances and dyes. This discussion is not merely a descriptive recitation of the ingredients, but also includes an indication of their mode of action and their interaction with other components.

A chapter on household detergents outlines composition ranges of laundry powders and liquids as well as specialty detergents, fabric softeners and laundry aids.

A series of brief chapters provides an introduction to industrial detergent formulations, detergent processing by spray drying and spray mixing, test methods and detergent analyses. The last chapter offers a useful collection of literature references for the analysis of individual ingredients.

The second half of the book deals with less strictly technical topics and examines the position of detergents within the world-at-

large. Chapters on economic aspects, ecological consequences and detergent laws regarding surfactants and builders, toxicology, textiles and household and industrial washing machines provide an excellent overview of these topics. Here, as indeed throughout the book, the point of view is global, covering markets not only in Europe, but in the U.S. and Japan as well.

The book has been translated well and edited with care. Since it was written by a group of scientists from Henkel KGaA, it is natural that developments originating with that firm receive top billing in the discussion. That minor objection notwithstanding, this is an excellent book for anyone who wishes to acquire a good background in detergents from a single, concise volume.

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