ORGANIC CHEMICALS DIVISION
RESEARCH AND DEVELOPMENT DEPARTMENTS

Project Analysis - Functional Fluids

Project:

Aroclor Defense

Objective:

Help defend Monsanto Aroclor business.

Justification:

Monsanto produces approximately 70$\overline{M}$ lb/yr of Aroclor. This goes into numerous formulated and blended Monsanto products and is sold in neat form for many industrial applications - particularly in dielectric applications. This business is in jeopardy due to a national hysteria about a buildup of chlorinated hydrocarbons in the biosphere. An all-out program to define the extent of the problem and work out the best overall solution to Aroclor pollution is underway. Part of this effort is directed to determining the extent of Aroclor biodegradability in the environment. It is to this end that this project is directed.

Status:

The various Aroclor of the biphenyl series, i.e., 1221, 1242, 1248, 1254, etc., are complex mixtures of chlorinated byphenyls of increasing haolgen content - percent of the latter being indicated by the last two numbers of the designation. No less than 46 individual compounds have been detected in Aroclor 1242 and the higher Aroclors may be even more complex.

Polychlorinated biphenyls thus far detected in the biosphere by some investigators have generally consisted of pentachloro or higher chlorinated isomers. A single case [J. H. Koeman et al, Nature, 221, 1126 (1969)] of Cl_3 and Cl_4 - substituted biphenyls (in European marine life) has thus far been reported. The finger has generally been pointed most strongly at the pentachloro and higher isomers.

From this and biodegradation data generated internally, there is reason to believe that chlorinated biphenyls of $C_{10}Cl_4H_6$ or lower may be sufficiently biodegradable to permit continued use in applications where environmental contamination could be reasonably controlled. Direct evidence of biodegradability of certain chlorinated biphenyls has been obtained by Vodden and R. A. Lidgett at Ruabon and Tucker and Swisher in St. Louis. The English workers are using an activated sludge with the organisms acclimated to biphenyl. These biphenyl-adapted organisms attack 2,4'dichlorobiphenyl rapidly in the presence of biphenyl. 4,4'-Dichlorobiphenyl appears to be more resistant, but 2,2',3' and 2,3',4'-trichloro byphenyls are attacked. Aroclor 1242 suffers selective attack of certain isomers as might be expected from the results obtained with single compounds. This work is still only in its early stages and much more time and experimentation will be required to get proper scientific evidence as to what is and is not degradable in the chlorinated biphenyl product line. The work in St. Louis is even less advanced.

Analysis of environmental contamination by Aroclor products present analytical problems of the first magnitude. These have in large part been mastered by Scott Tucker et al of the Organic Research Applied Sciences section. Concentrations of Aroclors in the ppb range can now be determined routinely. This capability makes possible the monitoring of Aroclors in the environment and in biodegradation studies which are now just getting off the ground.

Plans:

Responsibility	Action	Target Date
Org. Res. Applied Sciences Section Keller, Tucker et al	Determine Aroclor components in environmental samples, and in samples arising from biodegradation and feeding studies.	Continuing
QET/RWW	Provide single isomers, mixtures or Aroclor substitutes in support of Aroclor defense activities.	Continuing

Manpower Assignments:	Man Years
Technical	Approx. 0.5
Non-technical	Approx. 1.0

Estimated 1970 Costs:

$50,000

Job Nos. Applicable:

1348059

Sponsor: Q. E. Thompson

Date: January 1970

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