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Brief communications

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Chromatography in ecology

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The solution of the problem of ecology in all countries, namely the creation of waste-free technologies the utilisation of the materials obtained, the study of their metabolism under operating conditions, their regeneration, and their disposal, is impossible without chemical analysis of complex organic mixtures, which permits not only the determination of the overall content of the organic substance but also the establishment of the presence and the determination of the concentrations of specific mixture components. Chromatography combined with mass spectrometry, IR Fourier spectroscopy, UV spectroscopy, etc. has become such an analytical procedure.

Chromatography makes possible the selective determination of microimpurities at virtually any level, which is especially important in the solution of ecological problems. As a result of the chromatography of a mixture, the separated individual components pass to the instrument for their determination (mass spectrometer, IR Fourier spectrometer, etc.) and are then identified by spectroscopic methods. At the present time, all the leading and the majority of ordinary analytical laboratories abroad, engaged in the analysis of objects in the environment, are equipped with chromatograph-linked mass spectrometers and a large number of gas and liquid chromatographs.

The state of organic analysis in our country is extremely unsatisfactory: thus only one of each ten sanitary-epidemiological stations, i.e. the principal organ for the monitoring of the environment, is at present equipped with gas chromatographs and the number of liquid chromatographs is even smaller. We lag behind the USA by a factor of 5–6 as regards the manufacture of gas chromatographs and by a factor of 50–60 as regards liquid chromatographs. Chromatograph-linked mass spectrometers of modern design are not manufactured in the USSR and, according to our information, IR Fourier spectrometers, which might be used in combination with chromatographs, are not being developed either.

The foregoing shows that, for the successful solution of ecological problems, it is necessary to develop analysis and especially organic analysis on the basis of primarily chromatographic methods combined with mass spectrometry. For a rapid rectification of the existing situation, it is desirable to organise a methodological centre and regional analytical centres provided with modern equipment purchased abroad.

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Electrochemistry and protection of the environment

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There are many electrochemical aspects of the solution of ecological problems. In the first place, these include the creation of new industrial technologies, procedures for the purification of waste waters, and the development of sensors for the monitoring of the environment. Electrochemistry can also make a serious contribution to the creation of ecologically clean transport and power engineering.

A series of studies designed to protect the environment has been carried out in recent years at the Institute of Electrochemistry of the USSR Academy of Sciences. A procedure has been developed for the ultilisation of gas-absorption hydrochloric acid, which is a waste product of the large scale organochlorine synthesis in the electrochemical chlorination of ethylene to dichloroethane. This procedure is protected by patents. An experimental-industrial 5 kA apparatus has been constructed and tested jointly with the undertakings of the Ministry of Chemical Industry at the "Orgsintz" factory in Sumgaite. A technical requisition for a plan of an experimental works designed to produce 10000 tonnes of dichloroethane annually has been made. Unfortunately, the works has not so far been constructed and the contamination of the Caspian Sea continues.