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Ecological aspects of the technology for the application of pesticides

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Studies on the problem of reducing the amount of pesticides in order to diminish the pesticide stress on the environment have been prosecuted for many years at the Institute of Chemical Kinetics and Combustion of the Siberian Division of the USSR Academy of Sciences.

It is believed that, for the effective use of pesticides, it is essential to achieve a certain density of the pesticide deposit and to distribute uniformly its particles on the surfaces of plants with which insects come into contact. If this postulate is always valid, then estimates show that in this case the amounts used are minimal. However, our investigations showed that this is not always true. We demonstrated that the size of the particles influences significantly the efficiency of the pesticide and that there is an optimum particle size for which the consumption of the pesticide is minimal. This size depends on the type of plant, the insect species, the meteorological conditions, and the height of the source (depending on the technology of the application). Together with the Computer Centre of the Siberian Division of the USSR Academy of Sciences, theoretical models have now been developed, which, when executed on a computer, make it possible to determine the optimum particle size. Using this generator, experimental-industrial tests have been carried out in various regions of the country, on different cultures, and with different classes of pesticides. Overall, the experimental-industrial treatment was performed on an area in excess of 200 000 hectares. It was confirmed that the application of the optimum aerosol technology makes it possible to reduce the consumption of the pesticide by a factor of 2 to 10 compared with the traditional technologies. The levels of pollution of the vegetation are reduced by a factor of 10 and more and those of the soil by a factor amounting to tens and hundreds. Aerosol treatments exert a milder influence on biocenoses. The harmful consequences to animals and man are diminished. Labour productivity becomes tens of times higher, while the expanditure of labour and materials diminishes severalfold. Six self-financing enterprises have already been organised in various regions of the country. Our main activity is nowadays concentrated on the study of remote ecological and sanitary-hygienic consequences, on the expansion of the application of the optimum technology to other classes of physiologically active substances, on the training of cadres, on the development of specific technological regulations, and on further improvement of the aerosol technique itself.

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Ecological applications of the results of studies designed to assess the regulation and prediction of the stability of polymeric materials

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I should like to draw attention to a topic, not yet touched upon, which has a bearing on ecology and chemistry. The influence of chemistry on ecology should be manifested on at least three levels: the manufacture of chemicals, their exploitation, and their utilisation.

The matters discussed today in the Session concerned mainly problems of manufacture and the processes related to them. Very little has been said about the other two aspects, and yet this is a very important problem and certain approaches to its solution exist.

At the Institute of Chemical Physics, there exists a group of laboratories concerned with the problem of the regulation of the operational stability of a wide range of materials and not only polymeric materials.

The problem of prolonging the useful life of a material is in fact equivalent to increasing the scale of its manufacture and is therefore the problem of an ecologically clean method of increasing such manufacture.

However, it is not always necessary that the material should have the longest possible operational life. Very frequently a definite limited operational period is required after which the material should leave the system in an ecologically clean way. This is the second important problem on which studies are being conducted at the Institute of Chemical Physics of the USSR Academy of Sciences.