not manufactured in the USSR. In the purification of drinking and waste water, imported flocculants are mainly employed, a large amount of foreign currency being expended annually for their purchase.

Ultra-high-molecular-weight neutral, cationic, and anionic polymers, which proved to be effective flocculants for the conditioning of waste water deposits in Leningrad, the waste waters from animal husbandry complexes, and also from a number of paper and aluminium-magnesium industries, have been synthesised by novel methods at the Institute of Macromolecular Compounds of the USSR Academy of Sciences. The foundation for the development of a broad assortment of flocculants for different purposes was thereby laid at the Institute.

The "Akromidan-LK" flocculant, which is not inferior to foreign products in its efficiency and in a number of characteristics is superior to them, was most widely tested under different conditions. At the present time a technology for the manufacture of this flocculant is being developed and an experimental plant is being designed in which it is proposed to develop an industrial technology and to produce experimental batches of flocculants for wide scale testing.

In order to organise a wide scale industrial manufacture of new highly effective flocculants, it is essential in the first place to initiate the commercial manufacture of the starting material—amino-acrylates, the plants for the manufacture of which are at present moth-balled. This will make it possible to achieve the industrial production of Soviet highly effective flocculants and to solve the problem of providing flocculants for the existing technology for the dehydration of deposits both on urban purification plants and on purification plants of animal husbandry complexes and paper industrial undertakings.

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A new chemical technology—the basis of technological processes for the protection of nature

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The dramatic situation as regards the pollution of soil, water containing areas, and air caused by the industrial and agricultural activities and the ejection into the domestic environment of an enormous amount of organic and inorganic substances, various types of dust and gaseous, liquid, and solid products have made it urgently necessary to create fundamentally new technologies designed to protect nature and in many cases to save it.

Such a new technology, which may serve as a foundation for nature-protecting technological processes, is the controlled release technology (CRT). The physicochemical basis of the TRC is spontaneous processes—diffusion, osmosis, and dissolution, described by thermodynamic, Fick, and van't Hoff laws.

The control of the above processes using for this purpose the specific properties of high-molecular-weight compounds (matrix, transport, and constructional) will make it possible to construct entropic macromolecular chemical engines for the long-term and controlled metered injection of chemically and biologically active substances into any medium involving activity (the organism, soil, water-containing area, reactor, etc.). Macromolecular chemical engines (MCE) function without external energy sources as a result of the difference between the chemical potentials in the medium and in the MCE and by virtue of the increase in entropy in the "MCE—disposal medium" macrosystem.

The controlled release technology and macromolecular chemical engines can find and are finding applications in various branches of engineering and the national economy: plant cultivation, animal husbandry, the fishing industry, veterinary science, the health service, the food industry, in chemical engineering processes, in long term food storage, in protection against corrosion, and in autonomous systems, i.e. systems where prolonged controlled injection of various preparations is required: medicinal drugs, fertilizers, pesticides, biostimulators, inhibitors, catalysts, insecticides, herbicides, etc.

The use of the CRT in any of the fields listed above leads to the creation of new technological processes with the following features: ecological cleanliness—by virtue of the possibility of injecting the useful substance at a specified point in a strictly defined amount in the course of a specified period; the saving of resources—as a consequence of the elimination of the non-productive consumption of useful substances involving a balance between the rate of consumption and injection of the required components (for example, fertilizers); energy saving—as a consequence of the absence of the need for external energy sources to permit the functioning of controlled release polymer systems.

In support of the above postulates, three developments concerning the protection of soil, animals, and water containing area may be briefly described: the study and the cultivation of vegetables (cucumbers, tomatoes) by a non-traditional procedure, prophylaxis of strongyloidosis in cattle, and the development of polymeric devices for the measured microinjection of biologically and chemically active substances into water-containing areas.

It was shown in relation to the examples quoted that, in the growing of tomatoes and cucumbers on APION devices (devices for the metering of fertilisers), the consumption of fertilisers is reduced to the biologically necessary level (by a factor of 5–15), the crop is increased, the quality of the produce is improved, and the ecological cleanliness of the technological process is radically improved.

In the therapeutic and prophylactic treatment of cattle with the aid of LAUS devices (devices for the metered release of an antihelminthic preparation in the animal's stomach), the weight increment in the animals fed on pastures increases, and the quality of the pastures is improved by the faeces containing the antiparasitic preparation.

By ensuring prolonged metered injections at a specified rate of molluscocidal preparations into water-containing areas or flowing water systems with the aid of supercharged polymer pumps, one prevents the spreading of severe infective diseases of animals and humans without damaging the aquatic and terrestrial inhabitants of the ecosystem.

Overall, on the basis of the controlled release technology, it is possible to develop radically new technological processes, generating significant ecological, social, technical and economic effects and being directly designed to perform nature protecting functions, the husbanding of resources, and the maximum improvement of the human environment.
