THE AGE OF POLYMERS

Life depends fundamentally on organic polymers. If it was not so, we wouldn’t have food, clothing, shelter and transportation.

Indeed, nearly all the material needs of man could be supplied by natural organic products. The list of these materials and things made from them might be very long: wood, fur, leather, wool, cotton, silk, rubber, oils, paper, paint and so on. The organic polymers which these things are made from include: proteins, cellulose, starch, resins, and a few other classes of compounds.

But for the complexity and fragility of the molecules of the natural organic polymers they wouldn’t have defied the attempts to analyse their molecular structure until very recently

There would be no industry of man-made organic polymers, were it not for modern methods of physical and chemical analyses which uncovered the principles that govern the properties of the natural polymers. One could list the principal products as fibres, synthetic rubbers, coatings, adhesives and a lot of materials called “plastics”. Plastics and synthetic coating are already in common use. It is desirable that they should be used on a large scale, and get further developed.

Synthetic polymers now available already possess several of the properties required in a structural material. They are light in weight/ easily transported, easily repaired, highly resistant to corrosion and solvents, and satisfactorily resistant to moisture. It would be necessary to add that they have long-lived durability and resistance to high temperatures. A very important question could arise over whether synthetic polymers could be made inexpensive enough to compete with the structural materials such as metals and ceramics. The answer could be – “yes”.

It might seem odd that man came rather late to the investigation of organic polymers as the principal means of supporting life. The natural polymers such as proteins, cellulose and others dominated his existence and even in ancient times people used these materials.

Yet as late as the end of the 19th century polymer chemistry got little attention.

Chemists attacked sugar, glycerol, fatty acids and other ordinary organic compounds - dissolving, precipitating, crystallizing and distilling them to learn what these substances were composed of.

But only feeble efforts were made to investigate such common materials as wood, starch, wool, and silk. The substances composing these materials couldn't be crystallized from solutions, nor could they be isolated by distillation.

It was only in the 20th century that the scientists began thorough investigation of these materials. Having used some powerful physical instruments, an electron microscope, viscosimeter, X-ray diffraction apparatus, they could have revealed the polymers in all then intricacy. Their molecules were incredibly large, the molecular weights running , as high as millions of units, whereas simple organic substances such as, for instance, sugar and gasolene have molecular weights in the range of only about 50-500.

The giant molecules can be composed of a large number of repeating units, they being given the name "polymer" from the Greek word *poly* (many) and *meros*

(a part). Many polymers have the form of long, flexible chains. If the chemists had not found that out, they wouldn’t have been able to synthesize artificial polymers. This has led to the establishment of industries producing synthetic fibres and numerous polymeric materials, many of which were less expensive and superior in various ways to the natural materials.