Non-Metallic Materials Polymers

Akhmedov Sultan Mukaramovich

Tashkent state named after Islam Karimov senior teacher of Kokan branch of Technical University Candidate of Chemical Sciences

ABSTRACT

This article provides information about non-metallic materials, classification of polymer materials, composition of polymers, organic, elemental and inorganic polymers.

Keywords: chemical structure, spatial position, internal arrangement, organosilicon compounds, synthetic,

Introduction

Non-metallic materials are mainly polymer materials. Polymer materials are substances in which macromolecules are composed of a large number of elementary (monomers) links. The molecular mass of the compound can reach from 5000 to 1,000,000 g/m. in such cases, the properties of macromolecules in substances depend not only on the chemical composition of their molecules, but also on their arrangement and structure relative to each other. Macromolecules of polymers have a unique chain structure consisting of individual links. the length of the chain is several thousand times greater than the size of its cross-section, which gives them a high degree of uniformity (uniformity is limited to the joints of gypsum in the chain). The uniqueness of polymers is a unique feature of the system. atoms located in the main link are connected with each other by a strong chemical covalent bond. .while the bond energy is 330-360 kDj/mol, the molecules in the chain are connected to each other as a result of simple physical interaction, and the bond energy is much lower, 5-40 kDj/mol. Some complex types of intermolecular bonds are connected as a result of hydrogen bonds, and the binding energy of the bond can reach up to 50 kDj/mol. The binding together of molecules in non-metallic materials is usually called cohesion. polymer macromolecules consist of links with the same chemical structure (monomer) or different ones (copolymer). in polymer materials, the type of internal arrangement is important, that is, the joints and members of the material are located in a certain order in space. Because it is this location that determines the physical and mechanical properties of the material. natural polymers include natural rubber, cellulose, mica, asbestos, natural graphite, etc. But many types of polymers are obtained artificially (synthetically).

Polymer materials are mainly classified according to: composition, shape of macromolecules, spatial position, type of bonding and temperature.

According to their composition, polymers are divided into: organic, elemental organic and inorganic classes. the most important place is occupied by organic polymers. If the main chain of an organic polymer consists of only carbon

atoms, such polymers are called carbon chain polymers. In addition to carbon atoms, atoms of other elements can also participate in double-chain polymers. they dramatically change the properties of the material, for example: the presence of an oxygen atom in the macromolecule increases the rigidity of the chain, while phosphorus and chlorine atoms increase the flame resistance of the chain, sulfur atoms increase the gas resistance of the chain, and fluorine atomsprovides high chemical stability to the polymer.organic polymers mainly include resins of various origins and rubber.

The main chain of elemental organic compounds consists of atoms of inorganic elements (Si, Ti, Al) and organic radicals (SN3, S6N5, SN2). these radicals in it give the material high strength and uniformity, and atoms of inorganic elements give it high heat resistance. It should be mentioned that such compounds do not occur in nature. An example of this type of polymers is organosilicon compounds. inorganic polymers mainly include silicate glass, ceramics, mica and asbestos. These compounds do not contain carbon atoms. Inorganic materials are mainly composed of silicon oxide, aluminum oxide, magnesium oxide, calcium oxide and other oxides. in silicates, there are two types of bonds, i.e., the atoms in the link are covalently bonded to each other (Si - O), and the links in the chain are ionically bonded to each other . Inorganic polymers are characterized by high density and high heat resistance. but among them, silicate glass and ceramics have a very high fragility, and their resistance to vibration and directional loads is very low.

In addition, graphite is also included in inorganic polymers, but unlike them, it is composed of carbon chains. The specific properties of polymer materials are explained by the macromolecular structure of the polymer. According to their macromolecular structure, polymers are divided into: linear, ribbon, spatial or network types. Polymers with a linear macromolecular chain have a long linear or helical rope-like structure (Fig. 1.l, a), in which macromolecules with high uniformity and strength are located along the chain, which are shallow with each other. linked by a molecular bond. which provides the material with high elasticity, plasticity when heated and hardness when cooled (polyethylene, polyimide, etc.). Another type of linear polymer has a branched macromolecular chain (Fig. 1.l, b) which has lateral branching, which leads to its high density (polyisobutylene).

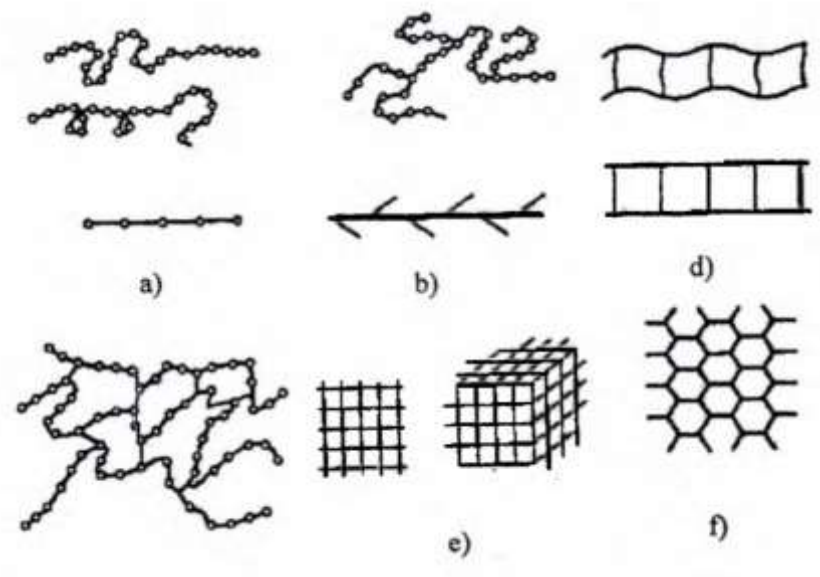

Fig. 1.l. Macromolecular structure of polymers: a - linear; b - branched; d - strip, e - spatial or mesh; f - parquet

References:

1. Горбаткина Ю. А. Адгезнонная прочност в системах полимер-волокно. — М.: Химия, 1987, 192 с.
2. Зуев Ю. С., Дегтева Т. Г. Стойкост эластомеров в эксплуатационных условиях. — М.: Химия, 1986. 264 с.
3. Каменев Е. И., Мясников Г. Д., Платонов М. П. Применение пластических масс: Справочник. — Л.: Химия, 1985. 448 с.
4. Кирпичников П. А., Аверко-Антонович Л. А., Аверко-Антонович Ю. О. Химия н технология синтетического каучука. 3-еизд. — Л.: Химия, 1987. 424 с.
5. Лахтин Ю. М., Леонтева В. П. Материаловедение: Учебник. 2-е изд. — М.: Машиностроение, 1980. 493 с.