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Polymer and Composition Materials

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Annotation: In order to create an existing stock of construction materials, firstly, it is necessary to use them sparingly, to increase the impact of the structure on the properties, and secondly, to find new types of raw materials and produce construction materials based on them. The most important of these materials are plastics, rubbers, cellulose-based materials, ceramics and composite materials. Composite materials based on metal, polymer and ceramic are the materials that will determine the future development of the technique. At present, these materials are helping to solve important technical problems. The need for them is growing. This article provides information about non-metallic materials, polymer materials, synthetic polymers, composite materials, polymer composite materials, their properties, properties, textolites.

Key words and phrases: Wood, leather, wool, silk, glass, rubber, cellulose, nitrocellulose, polyolefin, polyvinyl chlorides, polyamides, polyacetates, fluoroplasts, polycarbonates, polyurethanes, polyunsaturated, polyoxidates, epoxy, textolites.

Recently, artificial production of materials has been invented to meet the demand for materials. Artificial materials began to be produced that could replace materials such as wood, leather, wool, silk, glass, and rubber. For them, oil products and by-products of gas refining serve as raw materials. Non-metallic materials are divided into natural and artificial materials depending on their origin.

The process of forming simple chemical compounds or complex compounds from individual elements is called synthesis. Synthetic polymers are complex bodies, the formation of which is based on an in-depth knowledge of the molecular structure of natural polymers and the reaction properties of the elements that make it up.

Artificial polymers are also obtained by modification of natural polymers. For example, by the method of nitration of cellulose is obtained artificial polymer - nitrocellulose.

Polymer materials change their properties under temperature. According to this property, polymers are divided into thermoreactive and thermoplastic polymers.

Polymers are widely used as a stand-alone construction material or as a composite material in combination with other materials, as well as varnishes, curtains, fibers, paints and adhesives. Currently, the most widely used polymeric materials include polyolyphines, polyvinyl chlorides, polyamides, polyacytates, fluoroplasts, polycarbonates, polyurethanes, as well as phenol-formaldehyde, epoxy, polyester, silicon organic compounds and polyamide resins.

A complex body consisting of a mixture of soft and hard phases that provides uniformity and strength is called a composite material. Simply put, multi-component bodies themselves form composite materials, such as various compounds of granite and silicon. Examples of modern composite materials are reinforced concrete structures. Glass plastics created by adding polymer-based glass fibers are also examples of such materials. In recent years, a lot of polymer and metal-based composite materials have been produced.

The component that provides the integrity of the composite material is called the binding component (matrix). The placement of other components (fittings, fillers, etc.) in this matrix may or may not obey a particular geometric pattern. Between the matrix and the inserts is a special thin layer that defines the separation surface.

In polymer-based composite materials (PKM), polymer binders are used as a matrix that combines all the components to form a single whole. Examples of PKM are plastics. In the creation of plastics, the polymer base is brought to a state of high ductility or high elasticity, then additives are introduced by a certain technological method, after cooling (in the solid state) the composition base is in the glassy

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crystalline state. Nowadays, PKM has been created with very excellent properties, such properties as specific strength, corrosion resistance, controlled magnetic and electrical properties are not inferior to the properties of ordinary steel and cast iron construction materials. PKMs have been developed that maintain performance even at 200-400 ° C. In the future, such materials can be widely used in automobiles, ships and aircraft. Composite materials can also stop or reduce mechanical vibrations in machinery.

The above materials can be used both as a matrix and as additives. The adhesion of the matrix to the filler bodies cannot be mechanically formed. Because polymer macromolecules have a very strong covalent bond and the fillers are in a metal or ionic bond, it is difficult to form a strong chemical bond between the matrix and the filler elements. Therefore, a thin film layer is used to create an adhesive bond between the filler and the matrix. If the external force effect is distributed in proportion to the strength of the matrix and the fillers (or in proportion to the elastic modulus), the strength of the PKM will be greater. To do this, the elongation deformation value of the die must be greater than or equal to the deformation value of the filler (armature).

Typically, in most manufacturing enterprises, the production of products from PKM is carried out in conjunction with the technology of obtaining these materials.

Currently, thermosetting plastics are widely used in production. Resins such as phenoloformaldehyde, organosilicon, epoxy, as well as polyesters and various modifiers are used as binders. Among them, high-strength plastics can be obtained due to the strong adhesion of epoxy resins to the filler. Silicon organic binder-based plastics have a temperature resistance of 260-370 ° C when heated for a long time, phenoformaldehyde up to 260 ° C, and polyamide binders based on 280-350 ° C. One of the properties of polyester and epoxy resins is that they harden not only at high temperatures but also under normal conditions without separating additives and forming sediments. Laminated plastics are convenient materials for durable constructions. Between the thin-layer fillers, a material with an anisotropic property is formed by folding through the connecting elements. Such materials are produced in the form of sheets, pipes, plates. From them various details, items are made by mechanical processing.

Getinax is produced from various papers by impregnation with modified phenol, anilinoformaldehyde and urea resins. Getinax is an important material in the electrical industry. Some species are also used for decorative purposes. Getinax does not lose its properties up to 120-140 ° C, is also resistant to chemicals, liquid mixtures, food. They are widely used for this purpose in the interior of aircraft, railway carriages, ship's cabins as a decorative coating, as well as in the visual.

Textolites (binder - thermosetting resins, fillers - rags and paper waste) are also layered materials and are important in industry. They have high resistance to cracking and quench vibration loads. Depending on their use, there are structural, electrical, flexible and hermetic types. They are used to make noiseless large and small gears, interchangeable parts of bearings. They work 10-15 times longer than bronze, the operating temperature should not exceed 80-90 ° C. Structural textolites are used in washing machines, centrifugal pumps, turbines.

Pressed board or slab materials consisting of wood chips (or powders) and phenoloformaldehyde, also known as DSP, also have high physical and mechanical properties. They are widely used in construction as well as in machinery. For example, a gear made of DSP is much less noise-resistant than a steel wheel. The bearing made of them does not leave deep corrosion marks on the metal. They also make drive wheels (pulleys), bushings and many other automotive and tractor parts. However, the propensity of DSP to moisture is stronger.

Glass textolites, consisting of fiberglass and thermosetting resins, are also widely used in industry. But the disadvantage of such glass plastics is that they do not have the same properties (differ by 7-15%). Mechanical properties depend on temperature, and as the temperature rises, their mechanical properties decrease sharply. The modulus of elasticity is also not high. However, in terms of specific unit (E / o), k is not obtained from many metals, and in terms of specific strength (o / u) it is higher than that of steels.

One-way glass fiber plastics are widely used in aircraft load-bearing structures, car cabins, bodies, railway wagons and ships.

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