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CLASSIFICATION OF THE MOST COMMON CONSTRUCTION PLASTICS USED IN MECHANICAL ENGINEERING

Abstract. High specific strength, corrosion resistance, thermal and electrical conduction as well as a combination of other advantages of metallic materials cannot completely meet requirements of experts in development of brand new technical equipment and technologies. Moreover, developers and technologists have to take into consideration depletion of raw stocks of traditional machine-building materials and increased power inputs and efforts related to their exploration, output, and transportation and processing. Therefore the key problems of up-to-date material science cover development of structural materials using new types of raw materials, more integral application of traditional and secondary resources and optimization of material structures so as to impart them a complex of unusual and, often, contradictory properties. A

topical orientation in solution of these problems is development of machine-building materials based on synthetic natural and artificial binding materials. Plastics, rubbers, wood plastics and ceramic materials are among the most common and promising materials.

Keywords: Polyethylene; polypropylene; polyvinylchloride; fluoroplastics; plastifiers; polysterene; polymethylmethacrylate; pentaplast; polysulfones; polyethyleneterephthalate; polycarbonates; polyacrylates; polyamide; polyimides; phenol-formaldehyde resins; epoxy resins; urea-formaldehyde resins.

Plastics, materials based on polymers, are capable of acquiring a specified form on heating under pressure and maintaining it after cooling. Depending on the designation and conditions of operation plastics can con-tain auxiliary materials: filling compounds, plasticizers, stabilizers, pigments, lubricants, etc.

Manufacture of plastics which was born in the middle of the 19th century has been developing at a high rate since the late 1930s. In the early 1990s, the world's pro-duction of plastics was as high as 102 m tons/year, being increased by 52% in the period between 1980-1990. At present, the role of polymers in life activity of humans is so great that standards of living can be assessed by the levels of application of these materials. In the late 1990, the production of plastics in Belarus amounted to 58 kg/ man per year.

Depending on the temperature of forming of plastics the latter are subdivided into thermoplastics and reactoplastics, with the bases being composed of thermoplastic and thermoreactive polymers.

Reacoplasts are materials whose processing is accompanied by chemical reactions of formation of grid (three-dimentional) structure of macromolecules. In hardening, a plastic irreversibly loses the ability of transforming into thick-flowing state. Thermoplastic processing is not accompanied by cross-linking, and the material of a product maintains its ability to transform into thick-flowing

state. Figure 1 shows the nomenclature of technical plastics which find application as construction materials, as well as lacquers, fibers, paints and glues.

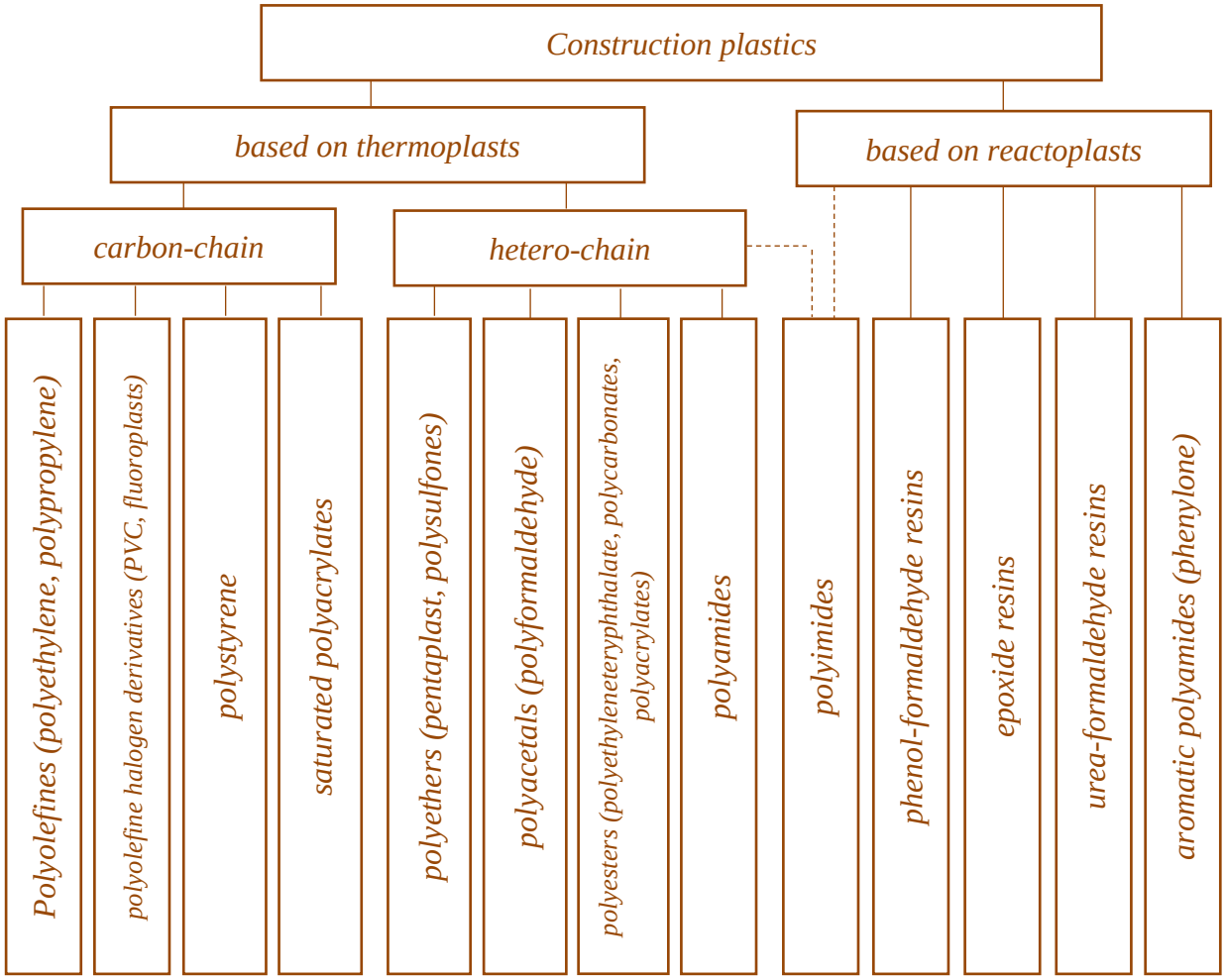

Figure 1. Nomenclature of the most common construction plastics

Thermoplastic materials are represented by an extensive group of polymer materials.

Thermoreactive plastics are distinguished from thermoplastics by increased thermal stability, almost complete absence of creeping under the load both at usual temperatures, stable physical and mechanical parameters over the exploitation temperature range. Generally thermoreactive (hardenable) plastics contain, along with a binding component (resin), fillings: powdered, fibrous or laminated. The majority of thermoreactive plastics are produced on the basis of phenol-formaldehyde, epoxy and urea-formaldehyde resins.

The raw materials base for synthesis of polyfofmaldehydes is comparable to that of PE. Therefore PF belongs to promising polymer materials. The main areas of PF application are machine elements, including elements of friction units: bushes, tooth gears, gear wheels, springs, instrument cases, elements of switches, taps, oil and gasoline lines.

Polyethyleneterephthalate (PETP) is a hard white polymer representing polyester of terephthalic acid and ethyleneglycol. PETP is mainly used in production of polyester fibers (lavsan). It is also used for production of films (base for tapes for tape transcripts and motion picture and photographic films, thermostable isolation of transformer winding) and molding goods (radio components, tableware, chemical and other equipment).

Polycarbonates (PC) are esters of carbonic acid produced by polycondensation of diphenylpropane and phosgene. PCs are used for production of components for construction and electric isolation purposes in machine- and instrument engineering (gear wheels, bearings, telephone sets, fans, kinescope screens, etc.), in medicine (blood filters, cases for drilling machines and dentures). Powdery PCs are used for application of coverings on metallic components.

Conclusion. Among thermoreactive polymer hetero chain materials, most promising are aromatic polyamides with the molecule containing aromatic fragments of varying structures that are connected by amide links. The advantages of aromatic polyamides are stability of properties at operating temperatures of -60 to + 250ºC.

Some types of these materials have heat resistance at temperatures of above 350ºC.

Of industrial significance is the aromatic polyamide phenylone. Due to their high mechanical properties, durability, thermal stability, heat stability and chemical stability phenylones are used for manufacture of friction parts,

including those operating at elevated temperatures (up to 220ºC), pressures of operating environment (up to 35 MPa) and loads (up to 25 MPa).

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