STRUCTURE OF WATERPROOFING MATERIALS

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Abstract
This article analyzes in detail the properties of waterproofing materials and studies the requirements for the surface on which waterproofing materials are laid.

Keywords: waterproofing, hydro geological conditions, building structures, crack resistance, types of loads, waterproofing coatings, service life.

In our Republic scientific researches on creation and introduction of technology of receiving new effective compositions of bituminous compositions with improved technological, physical-mechanical and operational properties on the basis of wastes of local oil and gas, chemical and oil industries are carried out. and certain results are achieved.

Waterproofing materials have two interrelated properties: internal structure and quality indicators. Contact with optimal structures is established, stable bonds in them provide stability of basic properties under various external and internal changes of the material in structures. The internal structure or structure of waterproofing materials is a certain character of bonds and order of adhesion of the particles forming them.

Their structure is characterized by chemical and physical-chemical bonds between contact particles of different degrees of dispersity. Their structure can be homogeneous and mixed. Homogeneous structures include crystallization, coagulation and condensation structures. Solids that do not have a crystallization structure are referred to amorphous solids. The structure does not remain unchanged. It is constantly changing, which is facilitated by the constant motion of atoms and molecules and their interaction with the environment [1].

Crystallization structures are formed as a result of crystallization of a solid phase and subsequent crystal growth into a solid mono- or polycrystalline aggregate. Under normal conditions, in the process of crystallization from solution or solute, an ordered arrangement of structural particles (atoms, ions, molecules) is formed in space in the form of crystal lattices. Each type of bonding corresponds to its own type of crystal lattice: ionic, molecular, atomic, with hydrogen bonds. However, real crystals usually have deviations from the ideal crystal structure: they contain lattice distortions, voids, dislocations, impurities, and this affects the properties of materials [2].

Coagulated structures are formed due to relatively weak forces of molecular interaction between particles - Vander Waals forces of adhesion acting through interlayers of liquid medium.

The medium forms a unique mobile spatial lattice in structure, which differs from the lattice of the rigid framework in crystalline structures.

Due to mobile layers, materials with coagulated structure possess thixotropy, i.e. the ability to liquefy when standing with a reverse restoration of structure and properties caused by mechanical influences (stirring, shaking, vibration, etc.).

Thixotropy, reduced strength, apparent creep are the most characteristic features of coagulation structure.Condensation structures arise due to direct interaction of particles or chemical compounds in accordance with the valence of the contacting atoms or under the influence of ionic and covalent bonds. .

The formation of mixed structures in the form of two or three homogeneous complexes is possible. such as crystallization-coagulation structure. etc. The coagulation structure may spontaneously change to condensation-crystallization, etc. Such changes impart various structures to the substance such as strength, deformation, thixotropy, etc., for example: at low temperatures [3].

Bitumen, resin, thermoplastic synthetic resin, etc. form a portable spatial grid of waterproofing material structures. As a rule, they have a homogeneous structure - coagulation, amorphous, etc.

Under operating conditions, the structure of these materials undergoes changes: at low temperatures, some components may crystallize with the formation of polydisperse organic crystals; at high temperatures - the transition to a viscous state with an amorphous structure; under the influence of factors of deterioration of serviceability in the structures and properties of the material may occur irreversible phenomena (thinning of intermediate layers, brittleness of the solid phase and increase in concentration, etc.).

Amorphous structure is characterized by the absence of crystals, chaotic arrangement of atoms, molecules, not oriented relative to each other. The amorphous structure is often visible because closer examination reveals a regular arrangement of molecules in the central part of individual microcrystals. At room temperature, natural and most synthetic rubbers, cellulose, polyisobutylene, and some other polymers used in the manufacture of waterproofing materials have an amorphous structure.

Bitumen, resin, thermoplastic synthetic resin and the like form a movable spatial grid of structures of waterproofing material. As a rule, they have a homogeneous structure - coagulation, amorphous, etc. Under operating conditions, the structure of these materials undergoes changes: at low temperatures, some components may crystallize with the formation of polydisperse organic crystals; at high temperatures - the transition to a viscous state with an amorphous structure; under the influence of factors of deterioration of serviceability in the structures and properties of the material may occur irreversible phenomena (thinning of intermediate layers, brittleness and concentration of solid phase, etc.).

Under certain conditions, the amorphous structure of the substance can gradually transition to crystallization, which is always more stable, but not always the most favorable for waterproofing materials. A certain volume in the structure is occupied by closed or communication openings. They may be of various origins and sizes, but in all cases pores in waterproof materials are undesirable because they reduce watertightness. Holes and other types of leaks are commonly referred to as defects in the material structure, as they can be stress concentrators and accumulators of aggressive media. Particularly dangerous are defects in the form of microcracks, which can pass into macrocracks [3,4].

In the production and use of waterproofing materials, optimal and rational structures are distinguished. In the optimal structure, components and pores are evenly distributed throughout the volume of the material, defects are absent or minimal, there is a continuous bonding layer in the form of a fixed or movable spatial lattice of the smallest size on average. The thickness of the liquid is average, films, but they are not dispersed. The structure has the highest packing density of solid components [4,5].

A suboptimal structure is a structure that does not satisfy at least one of the established mandatory optimality criteria. Optimal structures correspond to improved quality performance of materials. Expedient among such types of structures is the one in which the waterproofing material has a set of quality indicators determined in real conditions of production and operation [5].

Polyisol waterproofing materials differ not only in structure, but also in texture, that is, in the orientation of the main components. Typical textures are layered, fibrous, granular-cemented, granular-loose, irregular and combined. Often, for simplicity, textural properties are referred to as structural properties of a material. The composition, structure, textural properties of the material, as well as the nature of the internal thermal regime predetermine the basic properties of waterproofing materials [1].

Thus, based on the literature review, the internal structure and qualitative indicators of waterproofing materials, their interdependence are analyzed. Portable spatial meshes of structures made of bitumen, resin, thermoplastic synthetic resin and other waterproofing materials are considered. Types of existing waterproofing materials, arrangement, purpose, principle of action, division by construction of structures and reliability of electrical insulation are analyzed. The obtained data are planned to be used in further scientific research.

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