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СЕКЦИЯ №4: ЗАКОНОМЕРНОСТИ ОБРАЗОВАНИЯ МАКРОМОЛЕКУЛ И СУПРАМОЛЕКУЛЯРНЫХ ВЗАИМОДЕЙСТВИЙ В КОМПОЗИЦИОННЫХ МАТЕРИАЛАХ 674

FP-173. STUDY OF STRENGTH OF MODIFIED POLYMER SULFUR CONCRETE STRUCTURES

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In this article, the technology of obtaining modified sulfur and obtaining sulphurconcrete from the obtained product is studied. As a result, sulfur can be used as an additive in construction materials such as concrete and asphalt. The obtained results revealed their X-ray phase and elemental analysis. Based on the research results, it was described that the obtained modified sulfur concrete gives strength and durability to sulfur concrete even in high concentrations of acids or salts with the help of unsaturated organic binders.

Keywords: sulphur, polymer, modified, sulfur, quartz sand, crushed stone and klinets

Introduction

Sulfur is the tenth most abundant element on earth and has been considered a valuable chemical agent since ancient times. It has been used in medicine, fabric bleaching, lamp wicks, pistol powder, and more recently in the vulcanization of latex [1,2]. In developed industrial countries, highly reactive and toxic hydrogen sulfide (H_2S) diverges from oil refining residues. From crude oil gaseous mixture, elemental sulfur (S_8) is obtained with thermal expansion technologies [3]. Historically, the term "polysulfide" referred to both the inorganic forms of sulfur-containing covalent solids of sulfur ($–S_n–$) chains. , ionic compounds (Sn_2-, n> 2), and to organosulfur compounds in which the sulfur chain ends with organic substituents. R (R-S_n-R). In accordance with this nomenclature, the name polysulfide was created to describe inorganic ionic compounds [4,5].

The thermodynamically stable form of sulfur is orthorhombic sulfur, commonly referred to as α-S8, which is reported to convert to the monoclinic form β-S_8 at 95°C and exhibit a predominant melt transition at 119°C [6]. With continued heating of molten sulfur to a temperature above 159 °C, homolysis of the S–S bond gives thiyl radicals, which attack and open the ring of another S_8 molecule [7]. The polymerization then propagates by reopening the ring and forming an S–S bond between S_8 and the growing polysulfide chain. Although high molar mass polymers are readily formed into polymers by S_8, polymeric sulfur is chemically unstable at temperatures above the polymerization base temperature (Tf=159°C) because terminal sulfur radicals promote depolymerization back to cyclic monomeric sulfur [8].

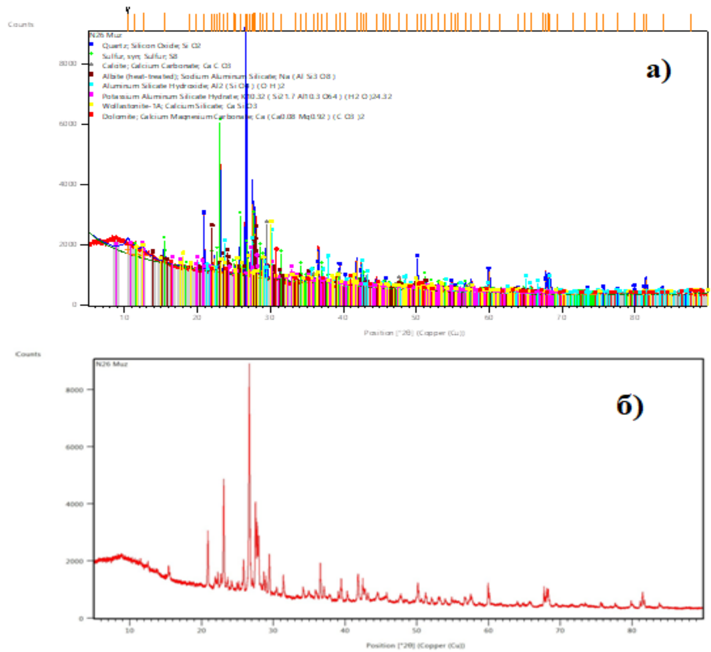
2. **Experimental part**

Sulfur polymer concrete (SPB, sulfur binder) was prepared from elemental sulfur and polymerization modifiers: pyrolysis distillate (PD) and gossypol resin (GS) in a ratio of 1:1. A certain amount of sulfur placed in a cylindrical tube with an inner diameter of 2 cm was melted in a glycerol bath, heated to 140 °C, and stirred vigorously with a mechanical stirrer. At this temperature, the modifying agent (PD) or (HS) was added to the molten sulfur at a rate of 5 ml/min per 1 µg 1 to final doses of approximately 2, 4, 6, or 8% by weight of sulfur. After completion of the addition of modifiers, the resulting SPB melt was stirred at a temperature of 135–140°C for another 20–30 min. The composite with waste was obtained by additional addition of ash and slag to the molten SPB in the form of a powder. The final content of ash and slag was 25 or 50% by weight of the composite, respectively. Continuous homogenization by mixing was carried out during the addition of waste and lasted approximately 10–20 min. SPB based on pyrolysis distillate with the addition of waste (at 135–140 °C), the formation of a gel-like (slightly rubber-like) consistency was observed. This prevented the uniform distribution of ash and slag over the entire volume of the prepared samples. They were then degassed by vibration on a vibrating table for about 5 minutes, after which the tubes were cooled to room temperature. The thus obtained monoliths of the hardened SPB and its composites in the form of cylindrical discs 2 cm in diameter and 4 cm high were used to evaluate their properties and the effectiveness of the obtained samples of sulfur concrete

3.**Result and its discussion**

When studying the composition and structure of sulfur concrete by X-ray phase analysis (Pic. 1), it showed that the reaction between sulfur and fillers proceeds solid-phase chemical reactions with the formation of compounds of complex composition, polysulfide compounds of various types are formed when sulfur interacts with filler.

In the reaction system, the modified sulfur reacts with alkali metals, fly ash and sand to cause complex chemical changes, the modified sulfur solidifies in the system through preheating. Since active sulfur is present in the reaction system, and during the reaction they combine with the iron phase and aluminum silicate to form a solid solution, and other phases present without a solid solution are easily packed by these intermediate layers.



Pic. 1. a and b. Diffractogram of sulfur concrete

The study shows that sulfur concrete in terms of phase and oxide compositions meet the stated characteristics and meet the requirements of regulatory documents.

4.**Conclusion**

The composition and structure of the modified sulfur of sulfur concrete was studied by X-ray phase and elemental analysis. It has been established that the sulfur concrete obtained on the basis of these modifiers significantly reduces the destruction of the compositions, and the use of calcium diamidophosphate and flyash from thermal power plants improves stabilization of the obtained compositions. It is recommended to obtain stable sulfur concrete based on them. The resulting new compositions are recommended for obtaining stable sulfur concrete, which does not lose its properties during storage.

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