

RESEARCH OF PROPERTIES OF ORGANO-MINERAL WATERPROOFING MATERIAL
MADE ON THE BASIS OF OIL WASTES

Tanzharikov P.A., Abilbek Zh.A.

The Korkyt Ata Kyzylorda State University, Kyzylorda, Kazakhstan
(120010, Kyzylorda, Abay ave., 66) e-mail:zhanyl.abilbek@gmail.com

Our approach to recycling of asphalt-resinous paraffin deposits (ARPD), consisting of organo-mineral waterproofing compounds based on the creation of a material having high physical and mechanical properties, using readily available and inexpensive components. For determining optimal composition of organic-mineral waterproofing material we have carried out laboratory tests of samples of different combinations. Also, we have conducted field studies on the experimental site, in order to substantiate environmental safety and confirm the technical efficiency of developed design. The results showed that the waterproofing material samples in contact with water oil products are extracted. Duration of contact with the water samples (one, two, three or four weeks) did not significantly effect on oil content in water samples ($0,60-0,70 \text{ mg/dm}^3$). This testifies that the extraction process is much faster.

Keywords: asphalt-resinous paraffin deposits (ARPD), organo-mineral waterproofing material, automobile tires, oil wastes

Oil and gas consumption in recent decades it has become one of the most important components of economic development of the Republic of Kazakhstan, which are in turn among the top five of ecologically unsuccessful domestic industries. In this regard, a new approach to the formulation and implementation of environmental projects of environmental protection in the oil-producing region is the practical implementation of the tasks set by the President of Kazakhstan Development Strategy to 2030: «The environmental, sanitary-epidemiological services and standardization bodies should work in accordance with priority goals» [1].

Our approach to recycling of asphalt-resinous paraffin deposits (ARPD), consisting of organo-mineral waterproofing compounds based on the creation of a material having high physical and mechanical properties, using readily available and inexpensive components[4,5].

As has been shown, the structure of organo-mineral waterproofing material, which determines its physical and chemical characteristics, due to the properties, quantitative and qualitative indicators constituting, technological receptions, conditions of subsequent hardening.[2,3]

One of the key issues to identify possibility of obtaining the material with the desired physical and mechanical properties is the purpose of the optimal composition of organo-mineral mixture of waterproofing, under which it is understood a combination of quantitative and qualitative components, ensuring compliance with the general requirements for the waterproofing design of material. For determining optimal composition of organic-mineral waterproofing material carried

out laboratory tests of samples of different combinations. Also, we have conducted field studies on the experimental site, in order to substantiate environmental safety and confirm the technical efficiency of developed design.

According to data Asphalt, resin and paraffin deposition fields have the following average chemical composition, wt.%: petroleum product (paraffins, oils, resins, asphaltenes) - 80...93, mechanical impurities - 1...5, water - 1...5. For using ARPD by adsorption chromatography determined the group composition, as well as the main properties that characterize this waste as a solid petroleum product and conditions of the phase transition by the methods listed below. In experimental studies have been used ARPD selected from Akshabulak field, Kyzylorda region.

For the preparation of finely divided material used construction clay with a specific surface area of 15 m² / g; building sand with a specific surface area of 25 m² / g; Building hydrate lime, rubber of waste automobile tires. The extraction of oil products from waterproof material carried by its contact with the water under static conditions at 20 ° C. For this, samples weighing 300 g was placed into the hermetic container with water, the volume 3 dm and held 28 days. After 7, 14, 21 and 28 days the water was sampled and analyzed for the content of oil. (Figure 1, Table 1, Table 2)

Table 1. Determination of the optimal range of organo-mineral waterproofing material composition

Components of the mixture	Composition, wt, %			
	Sample №3	Sample №4	Sample №5	The optimum composition of the mixture
Lime	15	10	15	10-15
Sand	15	20	15	15-20
Clay	43	47	45	43-47
ARPD	25	20	20	20-25
Rubber	2	3	5	2-5

Conducted studies have established the optimal ratio of the components of organo-mineral waterproofing material by weight. %: clay - 43 ... 47, sand - 15 ... 20, lime - 10 ... 15, ARPD - 20... 25, rubber - 2 ... 5.

Optimal material composition has a predetermined physical and mechanical properties: compressive strength- 85...100 kg/cm², water absorption- 0,7... 1,0%, filtration coefficient - 0,95·10⁻¹⁰... 2,0·10⁻¹⁰ m/s. Filtration coefficient is at a level of requirements of normative documents [1-3], applicable to means of anti-filtration protection of polygons by disposal and burial of all types of wastes.

Table 2. Results of laboratory tests of samples of the proposed organic-waterproofing material of different composition

№	Indicators	Composition, wt. %						
		Lime-20 Sand-10 Clay-60 ARPD-9 Rubber-1	Lime-5 Sand-25 Clay-40 ARPD-25 Rubber-5	Lime-15 Sand-15 Clay-43 ARPD-25 Rubber-2	Lime-10 Sand-20 Clay-47 ARPD-20 Rubber-3	Lime-15 Sand-15 Clay-45 ARPD-20 Rubber-5	Lime-12 Sand-17 Clay-46 ARPD-22 Rubber-3	Lime-12 Sand-15 Clay-43 ARPD-25 Rubber-5
		1	2	3	4	5	6	7
1	Compressive strength, kg/cm ²	37	40	85	120	100	95	88
2	Water absorption, %	1,35	1,1	0,96	0,65	0,70	0,90	0,95
3	Filtration coefficient, $1 \cdot 10^{-10}$ m/s	5,50	4,40	0,90	1,44	1,55	2,00	1,60

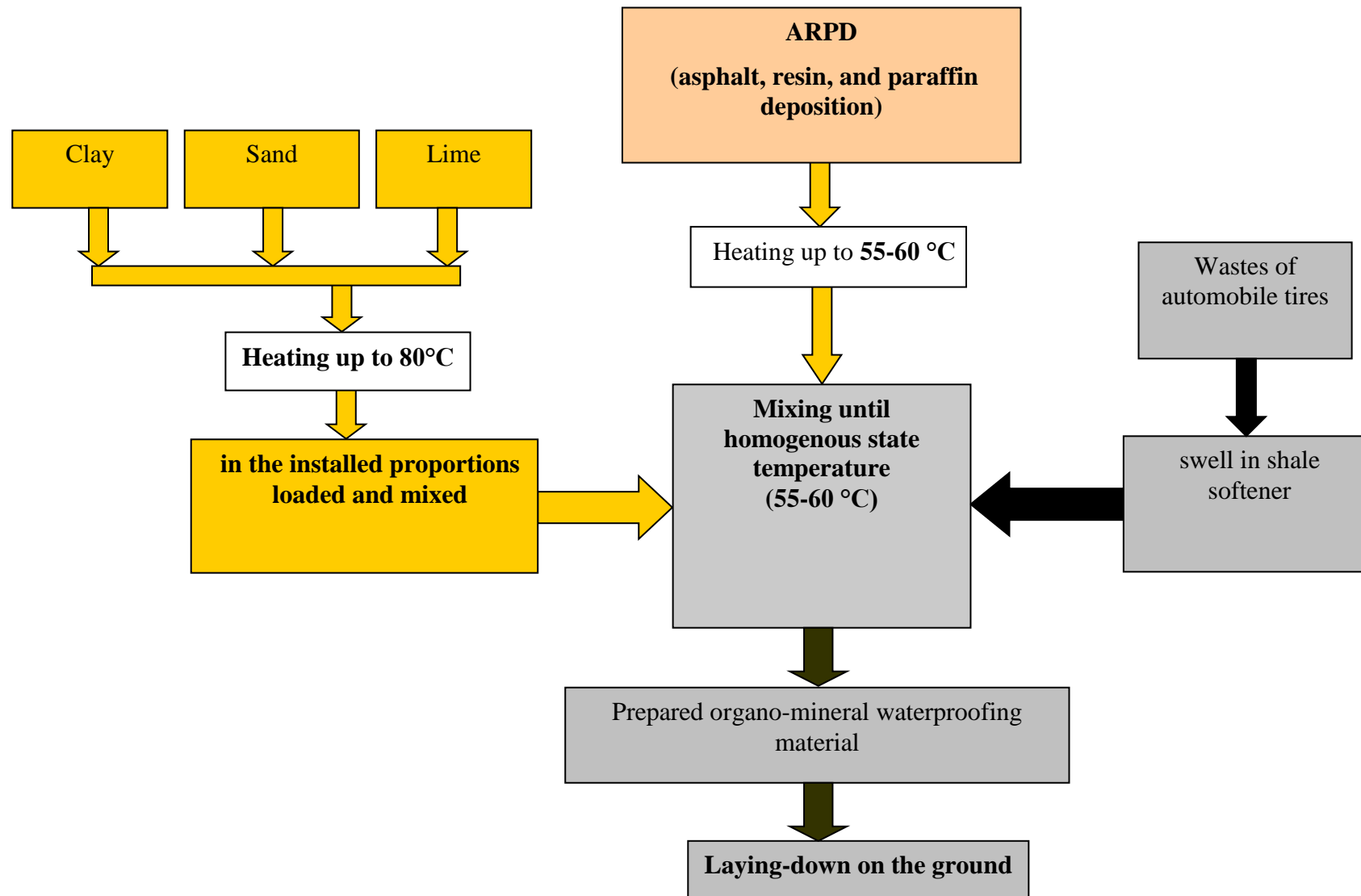


Fig. 1. Technological scheme of the sample preparation of organo-mineral waterproofing material on the basis of ARPD

The results showed that the waterproofing material samples in contact with water oil products are extracted. Duration of contact with the water samples (one, two, three or four weeks) did not significantly effect on oil content in water samples (0,60-0,70 mg/dm³). This testifies that the extraction process is much faster. Increasing the contact time does not affect to the extraction of oil products from the material. This positive factor may be used in the operation of waterproofing screen using the developed waterproofing material.

To determine the optimal composition of the proposed organic-mineral waterproofing material conducted laboratory studies of physical and mechanical properties of the samples of different combinations. The weight content of the components in the material samples was varied%: ARPD - 9...25, clay - 40...60, sand - 10...25, lime - 5...20, rubber -1...5, with step of varying the amount of each ingredient in the mixture is 5% or less. The composition of the proposed material samples and the results of laboratory studies of their properties are given in Tables 1 and 2.

Scientific importance of work is to expand opportunities of increasing waterproofing material production using oil waste as a secondary raw material resources, in order to solve ecological problems of oil producing regions of the Kyzylorda region.

Developed in the laboratory waterproofing material that meets normative requirements, justified as pilot tests and pilot projects.

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