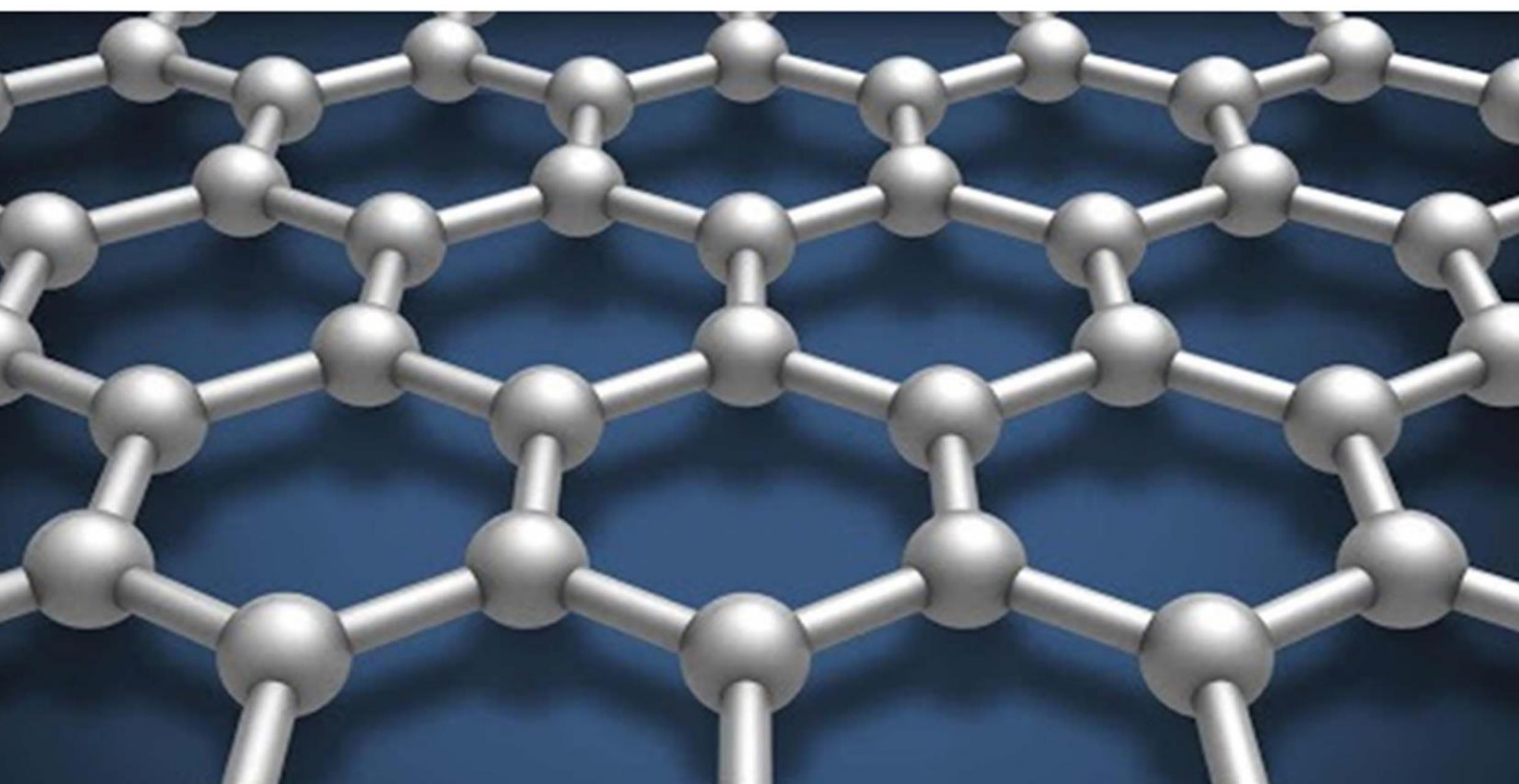


O'zbekiston

# **K**ompozitsion **M**ateriallar

Ilmiy-texnikaviy va amaliy jurnali



Узбекский научно-технический и производственный журнал  
**Композиционные материалы**

UDC 541:533.3:678.044

# STUDY OF PHYSICOCHEMICAL AND MECHANICAL PROPERTIES OF SYNTHESIZED OLEIN-PALMITIN PLASTICIZED RUBBER COMPOUNDS

Akhmedov A.H., Karimov M.U., Djalilov A.T.

*Tashkent Scientific Research Institute of Chemical Technology*

**Abstract.** The article analyzes the methods of processing and modification of polymer materials. The main goals in modifying the properties and systems of materials are defined. Increases in the production of additives are analyzed and their inclusion in the composition of rubber mixtures of plastics is shown. The plasticization method was mainly used to increase the elasticity and cold resistance of polymers and to facilitate processing technological processes. The results of experiments obtained in cooperation with the Tashkent Chemical-Technological Research Institute and the enterprises “Birinch rezinotexnika Zavodi” LLC and “URGANCH YOG'-MOY” JSC are presented. According to the obtained results, it is known that the physico-mechanical properties of the rubber mixture and the vulcanization process are changed by modification.

**Key words:** Polymer resin mixture, plasticizers, fillers, stearic acid, olein-palmitin, quality indicators.

**Introduction.** It is known that the economic development of each country and the well-being of its people depend on the types of energy produced and the quality and quantity of work-resistant polymer composite materials. Because nowadays it is difficult to imagine various sectors of the national economy without cheap, high-quality and durable composite materials produced on the basis of polymers. Agents that increase plasticity or elasticity in the processing and use of polymers and materials derived from them are called plasticizers. The appearance of a true solution of the polymer plasticizer indicates its compatibility with the polymer. If the polymer swells on its own in the plasticizer, then it is compatible with the plasticizer. In order to facilitate the processing of polymer materials, to modify their properties and systems, to obtain durable, high-quality, work-resistant and competitive products from them, various chemical additives are included. The production of additives (plasticizers, fillers, stabilizers, dyes and other substances) is increasing year by year. If in 1980, 4,000 tons of additives were produced, by 2017, their amount was 8,500 tons. There are more than 20 species, most of which are poisonous. All of them are included in the composition of plastics.

This makes it possible to increase the types and range of polymers [1-3].

One of the main methods of modifying the polymer system is their plasticization. The main purpose of plasticization is to increase the elasticity and cold resistance of the material by introducing various liquids or solids into the polymer composition and to facilitate the technological processes of processing [4-6].

Tashkent Scientific Research Institute of Chemical Technology and "First Rezinotexnika Zavodi" LLC and "URGANCH YOG'-MOY" JSC enterprises in cooperation with improving the physical and mechanical properties of rubber equipment, resistance to various external influences, wear and tear, etc. in order to reduce the consumption of imported stearic acid, scientific-practical work was carried out on the use of olein-palmitin mixture, which is a local raw material that can replace imports.

**Methods.** In the laboratories of "URGANCH YOG'-MOY" JSC and Tashkent Scientific Research Institute of Chemical Technology, experimental tests of raw materials of olein-palmitin mixture based on technical regulations were conducted, and the results are presented in table 1 below.

**Table 1**

**Physico-chemical and technological parameters of the experimental rubber mixture based on olein-palmitic acid of "Urganch Yog'-Moy" JSC**

| № | Test types                            | Indicators of a standard rubber mixture based on stearic acid | Indicators of standard rubber mixture based on olein and palmitic acid "URGANCH YOG'-MOY" JSC |
|---|---------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 1 | Curved vulcanization line 185°C·3 min |                                                               |                                                                                               |
|   | T30/s                                 | 32,63                                                         | 22,60                                                                                         |
|   | T60/s                                 | 34,92                                                         | 34,13                                                                                         |
|   | ML/dN·m                               | 7,23                                                          | 7,95                                                                                          |
|   | MH/dN·m                               | 14,14                                                         | 15,91                                                                                         |
| 2 | Mun viscosity (1+4) 100 °C            | 186,26                                                        | 184,18                                                                                        |
| 3 | Hardness (180°C*6 min)                | 56                                                            | 56                                                                                            |
| 4 | Elongation at break, %                | 511,77                                                        | 545,67                                                                                        |

|    |                                            |               |               |
|----|--------------------------------------------|---------------|---------------|
| 5  | Modulus of elasticity, MPa<br>100%<br>300% | 0,941<br>5,09 | 0,853<br>4,36 |
| 6  | Conditional tensile strength, MPa          | 12,99         | 12,70         |
| 7  | Dispersion                                 | 7,13          | 7,03          |
| 8  | Vulcanization of Munia t5 (127°C)          | 12:17         | 11:29         |
| 9  | Density                                    | 1,127         | 1,128         |
| 10 | Curved vulcanization line 150°C·30 min     | 125           | 117           |

It is known from the table that the physico-chemical parameters of the samples of the standard rubber mixtures based on stearic acid synthesized by us were compared with the standard rubber mixture based on olein and palmitic acid of "URGANCH YOG'-MOY" JSC, and the stearic acid substitute. In order to use raw materials of olein-palmitin mixture, rubber mixtures were prepared in laboratory conditions based on a standard recipe.

**Results and Discussion:** The cooled rubber mixture was tested in laboratory conditions on the "Electronic tensile testing machine "AI-7000"" device, such as its tensile strength, relative elongation at break, elasticity, modulus of elasticity; The kinetics of the vulcanization process were studied in the "Rotorless Rheometer (Vulcanization Instrument Without Rotor) M-3000A" device and the hardness in the "Shore Hardness Tester N14/1" device, and the results are presented in table 2.

Table 2

**The results of the study of the hardness, relative elongation, tensile strength and vulcanization process kinetics of rubber mixtures obtained on the basis of imported stearic acid and local raw material olein-palmitin mixture**

| № | Rubber compound                                                                           | Hardness | Discontinuity in relative expansion | Tensile strength $\geq$ Mpa | 180°C·4 min           |       |        |        |
|---|-------------------------------------------------------------------------------------------|----------|-------------------------------------|-----------------------------|-----------------------|-------|--------|--------|
|   |                                                                                           |          |                                     |                             | Vulcanization process |       |        |        |
|   |                                                                                           |          | N/mm                                | Mpa                         | T30 s                 | T60 s | ML dNm | MH dNm |
| 1 | Rubber compound obtained on the basis of imported stearic acid                            | 56       | 511,77                              | 12,9                        | 32,63                 | 34,92 | 7,23   | 14,14  |
| 2 | A rubber mixture obtained on the basis of a mixture of local raw materials olein-palmitin | 56       | 545,67                              | 12,8                        | 22,60                 | 34,13 | 7,95   | 15,91  |

Curvilinear vulcanization of the rubber mixture obtained in laboratory conditions, parameters such as munit viscosity, tensile strength, elastic modulus, required tensile strength, results of vulcanization processes under munit were checked, and the results are shown in table 3.

Table 3

**Curvilinear vulcanization, viscosity, tensile strength, elastic modulus, required tensile strength, results of vulcanization processes under munit of rubber mixtures obtained on the basis of imported stearic acid and local raw material olein-palmitin mixture**

| № | Types of experience                                                      | NK and imported stearic acid based on the indicators of the rubber mixture | NK and olein-palmitin indicators of acid-based rubber mixture |
|---|--------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------|
| 1 | Vulcanization curve 160°C·20 min<br>T30/s<br>T60/s<br>ML/dN·m<br>MH/dN·m | 34,9<br>45,7<br>1,5<br>21,05                                               | 34,75<br>45,1<br>1,55<br>20,9                                 |
| 2 | Viscosity by Munit (1+4) 100°C                                           | 40,02                                                                      | 39,12                                                         |
| 3 | Resistance to stretching, %                                              | 680,00                                                                     | 786,92                                                        |
| 4 | Modulus of elasticity, MPa<br>100%<br>300%                               | 0,602<br>1,39                                                              | 0,570<br>1,32                                                 |
| 5 | Conditional tensile strength, MPa                                        | 20,10                                                                      | 20,85                                                         |
| 6 | Vulcanization under Munit 5 (127°C)                                      | 12,4                                                                       | 15,2                                                          |

|                                                                                                                                                                                                        |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Saidmaxamadov N.M., Tadjiev N.X., To'xtaboyev I.T., G'aybullayev M.N., To'rayev A.N., Nurdinov Z.B.</b> Induksion pech va elektr yoy pechlarida po'lat suyuqlantirib olishda energiya balansi ..... | 74 |
| <b>Kucharov A.A., Yusupov F.M., Yusupov S.Q.</b> Research into the green technology of producing energy based on waste from coal, oil and gas industries .....                                         | 76 |
| <b>Akhmedov A.H., Karimov M.U., Djalilov A.T.</b> Study of physicochemical and mechanical properties of synthesized olein-palmitin plasticized rubber compounds .....                                  | 79 |
| <b>Жумаева Г.Т., Тошев А.Ю., Қодиров Т.Ж.</b> Эластик полимер-адгезивларни олиш ва уларнинг физик-механик ва кимёвий хоссалари тадқиқоти .....                                                         | 81 |

### 3. Разработка и технология получения композиционных материалов

|                                                                                                                                                                                                                                                                          |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Курбанкулова М.Б., Пулатова Д.Г., Ахунджанов К.А.</b> Разработка новых ячеистых газобетонов с улучшенными характеристиками .....                                                                                                                                      | 85 |
| <b>Пирматов Э.А., Шодиев А.Н., Темиров К.А., Сафаров Г.Т.</b> Разработка технологии комплексной переработки обожженного молибденового промпродукта: методика исследований и проведения экспериментов .....                                                               | 89 |
| <b>Рахимов Х.Ю., Ганиева Х.Б., Абдурахмонова С.П.</b> Разработка эффективных композиционных гидрофобизирующих эмульгирующих материалов на основе местного сырья и отходов производств для получения нефтеэмульсионных буровых растворов .....                            | 92 |
| <b>Эргашев Н.Э., Абед Н.С., Муродов И.И., Абдукаххаров А.А., Негматов Ж.Н., Бозорбоев Ш.А.</b> Разработка эффективных составов композиционных полиэтиленовых материалов триботехнического назначения для применения в рабочих органах хлопковых машин и механизмов ..... | 94 |
| <b>Тургунов А.А., Негматов С.С., Абед Н.С., Негматова К.С., Икрамова М.Э., Солиев Р.Х.</b> Разработка эффективных эпоксисилоксановых композиционных материалов, конструкций и покрытий на их основе .....                                                                | 97 |

### 4. Прикладные, экономические и экологические аспекты применения композиционных материалов

|                                                                                                                                                                                                                                                                        |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Yoqubov M.M., Jumayeva X.Yu., Yoqubov O.M., Maksudxo'jayeva M.S.</b> Murakkab mis-porfirlangan rudalar va mis sanoatining shlaklarini flotatsion boyitish xususiyatlari .....                                                                                       | 100 |
| <b>Шакарова Д.Ш., Бегимкулова Ч.К., Собитов М.А., Перри К.С.</b> Золь-гель синтез фиброин/кремнеземного наногибридного адсорбента и его характеристика .....                                                                                                           | 104 |
| <b>Рузматова А.Ш., Матчанов Ш.К., Сабинова Ф.Р.</b> Исследование сырьевых материалов для получения алюмосиликатных вяжущих .....                                                                                                                                       | 107 |
| <b>Bobojonov Kh.Sh., Usmanova Kh.U., Smanova Z.A.</b> Study of protolytic properties of organic reagents used in the determination of aluminum and gallium ions in the luminescent method .....                                                                        | 111 |
| <b>Касымова М.Н., Негматова К.С., Лапасова Ф.А., Ганиева Д.Ф., Бабажанова М.А.</b> Теоретические и практические аспекты крещения белковых волокон и тканей на их основе композициями на основе солей поливалентных металлов и органо-неорганических ингредиентов ..... | 114 |
| <b>Туробов Ш.Н., Боймуродов Н.А., Хужакулов А.М.</b> Исследование и анализ перспективных методов извлечения вольфрама из руд в технологии переработки .....                                                                                                            | 118 |
| <b>Юсупов У.С., Хасанов У.А., Қурбонов Б.Т., Эргашев М.А.</b> Сульфидли маъдан ва мисли тошқолларни бирга қайта ишлаш технологияси .....                                                                                                                               | 121 |

### 5. Методы исследования, приборов и оборудования композиционных материалов

|                                                                                                                                                                                                                             |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Nazirov Sh.S., Turayev X.X., Turabov N.T.</b> 7-brom-2-nitrozo-1-oksinaftalin-3,6-disulfokislotalasining analitik tavsiflari va uning mis(II) ioni bilan hosil qilgan kompleks birikmasining spektroskopik tahlili ..... | 127 |
| <b>Murtazayev A.M., Haydarov I.Q., Yodgorov N.N.</b> Kompozitsion birikmali burg'ilash qorishmalarining quduqlarni burg'ilash jarayoniga ta'sirini baholash .....                                                           | 130 |
| <b>Turayeva M.J., Raximov S.B., Smanova Z.A.</b> Kadmiy (II) ionini kadion irea yordamida sorbsion-spektrofotometrik aniqlash .....                                                                                         | 133 |
| <b>Yoqubov M.M., Sunnatov J.B., Yoqubov O.M., Maksudxo'jayeva M.S., Suzeva S.N.</b> Oltin o'z ichiga olgan mineral va texnogen xom ashyoni qayta ishlashning pirometallurgik usuli .....                                    | 136 |
| <b>Tursunova D.R., Mamatkulova S.O.</b> TiO <sub>2</sub> asosidagi fotokatalitik materiallarning xossalarini spektrofotometrik usulda aniqlash .....                                                                        | 139 |
| <b>Erbo'tayev D.Sh., Bekpo'latov H.O., Sultanov S.O., Abdullayeva G.H.</b> Bazi noorganik moddalarni x-nurli difraktometri (XRD) yordamida fizik-kimyoviy xossalarini tadqiq qilish .....                                   | 142 |
| <b>Рахимов Х.Ю., Аюпова И.Х., Юсупходжаева Э.Н.</b> Синтез и получение эмульгаторов на основе продуктов дистилляции хлопкового масла соапстока и аминокспиртов .....                                                        | 146 |
| <b>Ихтиярова Г.А., Исомитдинова Д.С.</b> Синтез хитозана из подмор пчёл <i>apis mellifera</i> криогенным способом и получение на его основе металлокомплекса хитозан-серебро .....                                          | 148 |
| <b>Ismailova R.M., Rajabova E.B., Ismailov R.I.</b> Polimer kompozitsiyalari bilan ishlov berilgan tabiiy charmning elektron mikrofotolarini tadqiqi .....                                                                  | 151 |