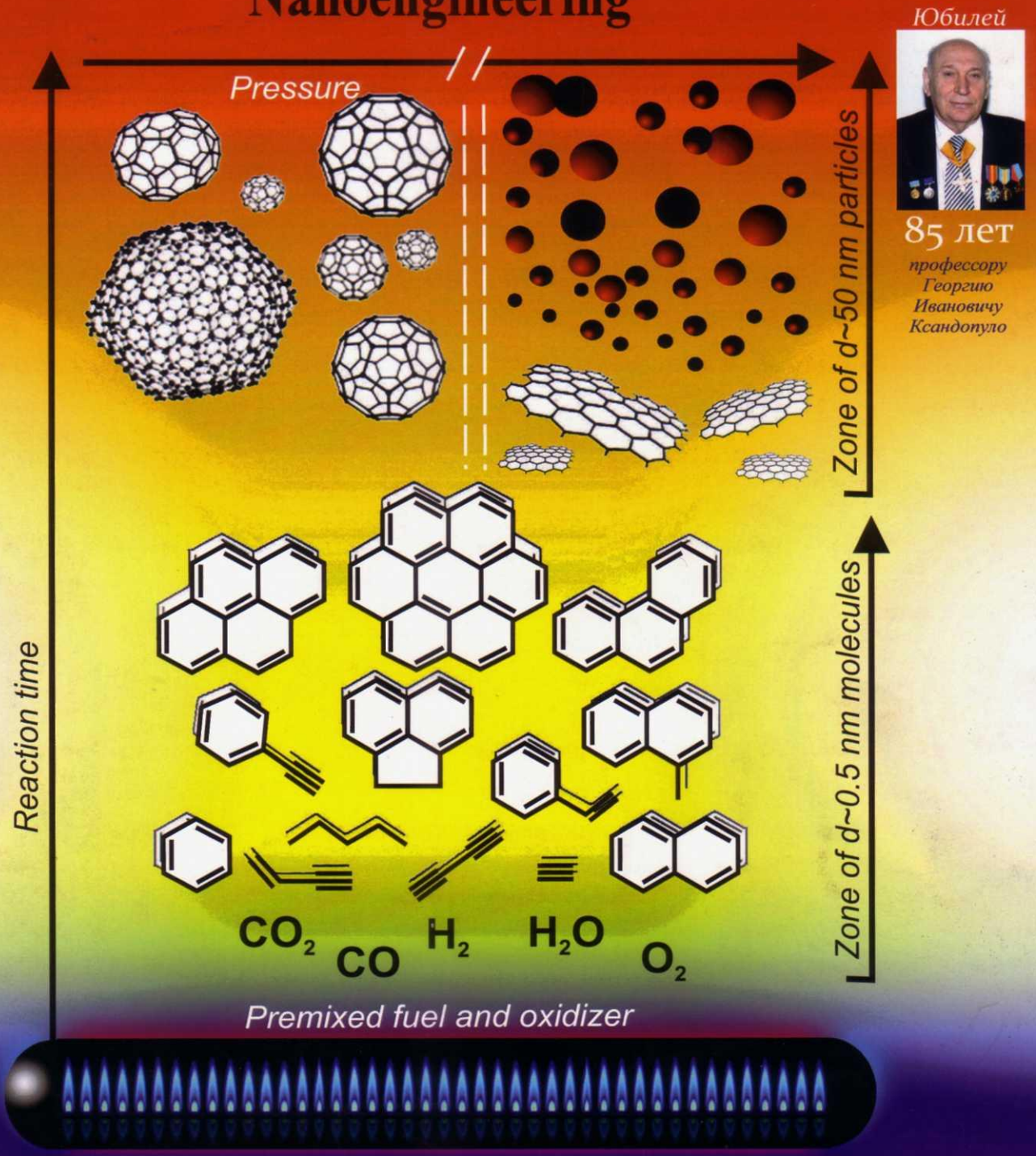
The Ministry of Educanion and Science of the Republic of Kazakhstan - Scientific Committee
Al-Farabi Kazakh National University; The Institute of Combustion Problems

Proceedings of
VIII International Symposium
Physics and Chemistry of Carbon Materials/ Nanoengineering



Юбилей

85 лет

профессору Георгию Ивановичу Ксандопуло

VIII Халықаралық Симпозиум

Көміртекті материалдардың физикасы мен химиясы / наноинженерия

VIII Международный Симпозиум

Физика и химия углеродных материалов / наноинженерия

September 17-19, 2014, Almaty, The Republic of Kazakhstan

Ministry of Education and Science of the Republic of Kazakhstan
Committee of a science MES RK
Al-Farabi Kazakh National University
Institute of Combustion Problems

Қазақстан Республикасының Білім және Ғылым Министрлігі
ҚР БҒМ Ғылым комитеті
Әл-Фараби атындағы Қазақ ұлттық университеті
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Министерство образования и науки Республики Казахстан
Комитет науки МОН РК
Казахский национальный университет им. аль-Фараби
Институт проблем горения

Compilation of materials
of VIII INTERNATIONAL SYMPOSIUM
«PHYSICS & CHEMISTRY OF CARBON MATERIALS/
NANOENGINEERING»
17-19 september 2014

«КӨМІРТЕКТІ МАТЕРИАЛДАРДЫҢ ФИЗИКАСЫ МЕН
ХИМИЯСЫ/ НАНОИНЖЕНЕРИЯ»
VIII ХАЛЫҚАРАЛЫҚ СИМПОЗИУМ атты
материалдар жинағы
17-19 қыркүйек 2014 ж.

Сборник материалов
VIII МЕЖДУНАРОДНОГО СИМПОЗИУМА
«ФИЗИКА И ХИМИЯ УГЛЕРОДНЫХ МАТЕРИАЛОВ/
НАНОИНЖЕНЕРИЯ»
17-19 сентября 2014 г.

Алматы
«Қазақ университеті»
2014

PRODUCTION HYDROPHOBIC SAND BASED ON SOOT

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Abstract

In this paper was created hydrophobic sand based on soot having superhydrophobic properties synthesized by burning of plastic waste. Hydrophobicity of obtained sand was determined by the contact angle.

Introduction

Preparation of hydrophobic loose materials is an important area of investigation. We synthesized superhydrophobic soot through the combustion of polyethylene waste and created hydrophobic sand on the bases this soot. Hydrophobicity is characterized through the contact angle for water droplets placed on a surface covered with this obtained soot.

Hydrophobic materials - this material to protect stone, brick, concrete and stucco surfaces from damaging effects of water and atmospheric phenomena. Availability of water at the building or construction leads to emergence of moisture on the basis of walls, under plates of overlappings, rusts in the basis of steel support, to decolouration or rotting of wood, panels and other objects near a floor, walls or a ceiling; there is a mold on concrete, plaster, furniture, carpets, or wall-paper, a dampness smell, water condensation at windows, moss growth and etc. Moisture penetrating into the capillaries has a destructive effect on the building materials.

Thus, there are today universally recognized need for hydrophobic composite materials whose production would be beneficial, and use effectively. This article presents the results of research on the sand on the basis of carbon black having superhydrophobic properties synthesized by burning of plastic waste.

Materials and methods

Material

During combustion of hydrocarbon fuels particles of soot are a by-product of combustion. But if burn fuel under certain conditions, it is possible to produce a carbon black with specified properties [1, 2]. Our proposed work is to create a hydrophobic composite building material which was obtained based on soot having superhydrophobic properties by burning a polyethylen waste.

For polyethylene flame plastic waste was placed in a hermetic rector and was exposed thermally decomposed without access to air at a temperature of 900 - 970 K. As a result of decomposition of polyethylene form easily a condensable gas having white colour, which, when burned, burns resistant smoky flame. The obtained soot was precipitated on the surface of the nickel substrate. A method of producing a superhydrophobic soot by proposed method is described in detail in [3].

The production technology of hydrophobic sand includes some stages. In the first of all on a surface of sand was placed the glue, the next step was processing by a hydrophobic filler. After goes process of hardening. We used usual washed river sand, as a glue of basis was applied polyurethane glue which dissolved in ethyl acetate. The content of glue mass no more than 5% from the weight of hydrophobic sand. The sticky layer is put on a surface of sand for subsidence of a polyurethane film from solvent. For what sand with the polyurethane glue which was dissolved in ethyl acetate, is exposed to intensive hashing, volatile solvent is evaporated and on a surface of sand is formed the nanodimensional film of polyurethane.

In the obtained thus sand with adding 1% of superhydrophobic soot and calcium stearate, the received weight at a temperature of 40-90 °C mixes up with a speed of 60 about / sec. within 30 minutes. During hashing the surface of grains of sand is enveloped by a nanodimensional film from a mix of hydrophobic soot and calcium stearate. The role of superhydrophobic soot consists in increase of degree of adhesion of a hydrophobic film on surface grains of sand, their hydrophobic properties and reduction of time of hardening.

Results and discussion

The obtained sand has exclusive hydrophobic properties. In Fig. 1. presented a photograph of the behaviour of water drops on the surface of obtained hydrophobic sand. The wetting angle of water droplets is more 150 degrees.

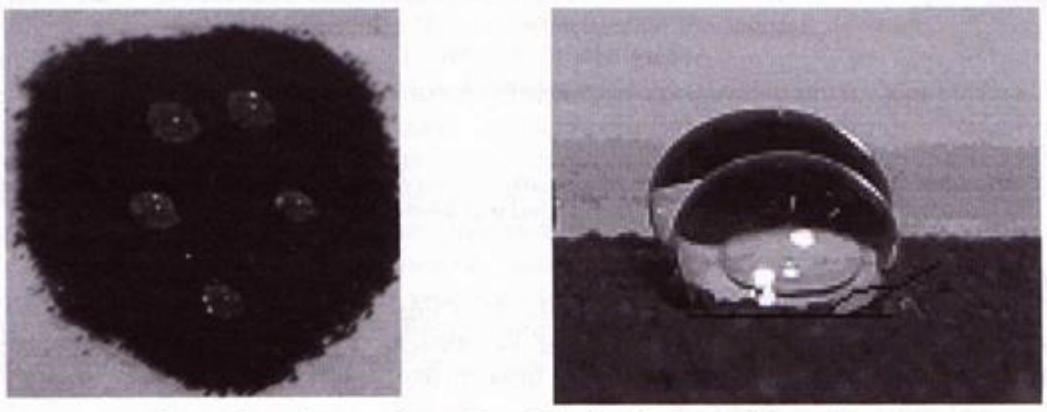

Fig. 1. Water drops on the surface of obtained hydrophobic sand

The most important and reliable information on the structure of the resulting hydrophobic particulate material can give scanning electron microscopy. The samples of hydrophobic loose materials were investigated by SEM. SEM studies showed that soot fully envelops surface of grains regardless of their size.

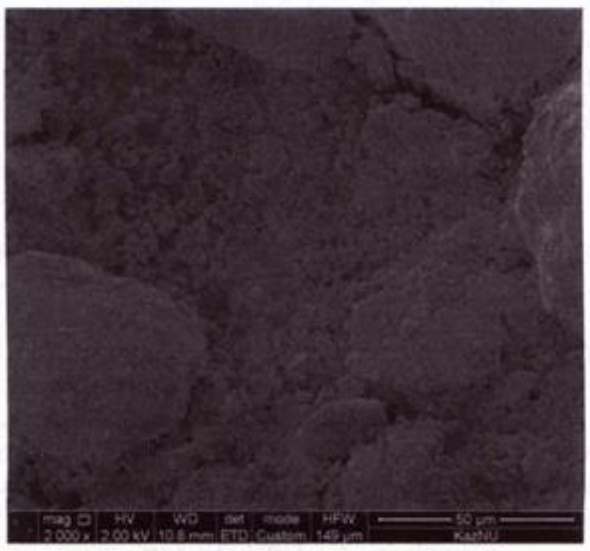

Fig. 2. Electron microscope images of the surface of sand

Studies have shown that soot having superhydrophobic properties completely envelops the surface of grains of sand with uniform layer thickness of 20 nm. Tests were conducted on the mechanical abrasion the soot particles from the surface of grains. Tests showed that the process of stirring for 2 hours does not lead to a reduction in film thickness of the soot. Optical and electron microscope images of the surface of sand presented in Fig. 3.

Conclusions

Thus was created hydrophobic sand based on soot by burning of polyethylene waste. The offered method allows making hydrophobic not only a blanket of grains of sand, but also its volume weight that significantly increases quality of protection against moisture penetration. The obtained hydrophobic sand is

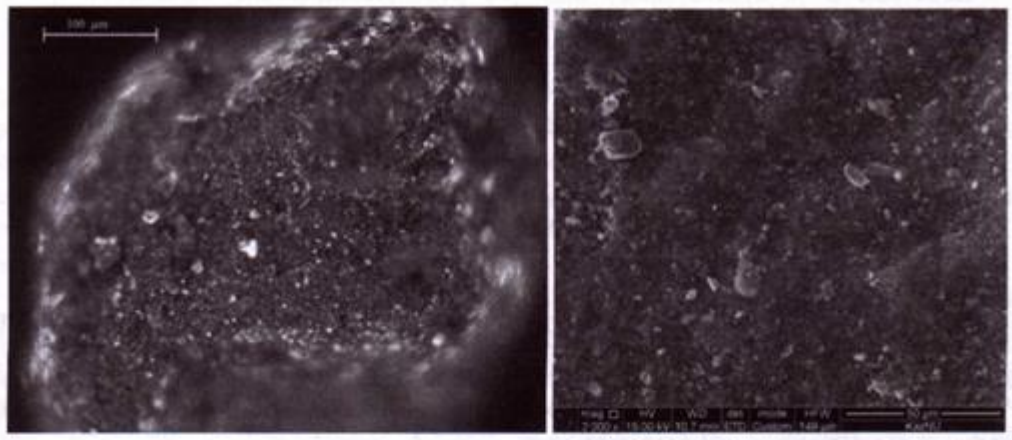

Fig. 3. Optical and electron microscope images of the surface of sand

offered to be used as filler in construction materials for external finishing and in agriculture for prevention of infiltration of irrigation water in the bottom layers of soil or its evaporation.

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