The sorbent for liquidation of oil spills on the basis of chitin

© **Chan I Doan Chang**, **Kuen Thi Kuin An**, **Maria A. Ivanova**,
Yanov V. Vladimirovich, and **Liubov A. Zenitova***[+]
Kazan National Research Technological University. K. Marx St., 68. Kazan, 420015. Republic of Tatarstan.
Russia. Phone: +7 (843) 231-42-51. E-mail: zenit@kstu.ru

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*Supervising author; [+]Corresponding author

**Keywords:** khitin, sorbent, oil.

Abstract

The article presents data on the development and analysis of the main indicators of the sorbent based on elastic polyurethane foam with 30-45% by weight filling with chitin.

The technology of sorbent production involves mixing powdered chitin with polyol components of polyurethane synthesis. Further, when the filled component A is mixed with the isocyanate component B, a sorbent is obtained which after grinding is used to study the process of its absorption of the Romashkinskoye oil deposit, Tatarstan.

The component A for elastic PPU (A (el)); component B (el) for elastic PPU or component B (g) for rigid polyurethane foam have been used to obtain the sorbent. The weight ratio of components A and B was 1: 0.6. Chitin was used as a filler with a nominal particle size of 5.0-10.0 mm, a bulk density of 0.198 g/cm^3.

The oil capacity of the sorbent was determined from the difference in mass of the saturated and initial sorbents after 1; 1.5; 2; 3; 5; 8; 10; 15; 20; 304-60; 90 and 120 minutes of his stay in oil. The oil saturation was assumed to be the maximum saturation of the sorbent with oil, when the curve of the dependence of the oil capacity-the time of absorption-appeared on the plateau.

In addition, the technological parameters of foaming were estimated: "start time" and "rise time" of the foam, as well as the apparent density with free foaming of the sorbent (according to TU 6-55-32-89): start time (τ_c, c) – time from the beginning of mixing "component A with filler" with "component B" to clearly visible increase in the volume of the mixture of components; time of rise (τ_p, c) – time from the beginning of mixing of components to the end of increase in volume.

The apparent density was determined on samples cut from a polyurethane-based sorbent and chitin with free foaming.

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"Start time" PPU for a sorbent made by recipe A (el.) : B (g) comes somewhat earlier than for a sorbent made according to recipe A (el.) : B (el.). The dependence for the "rise time" parameter of the polyurethane foam is also similar. High temporal parameters in comparison with traditional ones for polyurethane foam are due to the presence of a relatively large amount of "heavy" filler in the composition.

A considerable amount of oil is sorbed in the first 15-20 minutes, which in many respects determines the oil sorption of the sorbent. Then the sorption rate decreases.

All sorbents possess a sufficiently high oil content from 6.92 to 8.03 g/g. The most effective is the sorbent, made by recipe A (el.) : B (el.). Its absorption capacity with respect to oil is ~8 g/g.

It has been established that a sorbent using chitin exhibits sufficient sorption properties.

References

[1] The electronic resource http://fb.ru/article/223301/hitin---chto-eto-takoe-primenenie-hitina
[2] Electronic resource http: //fb.ru/article/223301/hitin---chto-eto-takoe-primenenie-hitina#image1069900
[3] L.F. Gorovoy, V.N. Kosyakov. Sorption properties of chitin and its derivatives: chitin, its structure and properties. Chitin and chitosan. Reception, properties and application. _Moscow: Nauka._ 2002. P.217-246. (russian)
[4] S.V. Nemtsev. Complex technology of chitin and chitosan from the shell of crustaceans. The Germans. _Moscow: VNIRO._ **2006**. 134p. (russian)

[5]   N.S. Chikina, A.V. Mukhamedshin, L.A. Zenitova. Ensuring environmental safety in hydrocarbon spills using a sorbent based on polyurethane foam and buckwheat husk. *Safety of vital functions.* **2008**. No.9. P.49-53. (russian)

[6]   N.S. Chikina, A.V. Mukhamedshin, L.A. Zenitova. The use of a sorbent based on polyurethane foam and buckwheat husk to reduce the ecological load on water areas. *Protection of the environment in the oil and gas complex.* **2008**. No.10. P.53-57. (russian)

[7]   N.S. Chikina, A.V. Mukhamedshin, A.V. Ankudinova, L.A. Zenitova, A.S. Sirotkin, A.V. Garabagiu. Reduction of the ecological load from oil and petroleum products spills with the help of sorbent on the basis of polyurethane foam and cereal crops wastes. *Bulletin of Kazan Technological University.* **2009**. No.6. P.184-192. (russian)

[8]   M.A. Ivanova, R.T. Murtazin, L.A. Zenitova. Centrifuging as a method of regeneration of absorbed oil by GRINSORB sorbent. *Bulletin of the Kazan Technological University.* **2012**. Vol.15. No.21. P.127-129. (russian)

[9]   M.A. Ivanova, Le Quang Dien, Tran Hai Ninh, Mingaleev N.Z., Zenitova L.A. The sorbent for oil spill liquidation based on polyurethane foam and waste of natural resources of Vietnam. *International Workshop on Nanoscience and Nanotechnology Opportunities for Academia & High Tech Industry Joint 4th Asia-Pacific Chemical and Biological Microfluidics Conferences (IWNN-APCBM 2015).* **2015**. Da Nang, Vietnam. P.184.

[10]   M.A. Ivanova, L.A. Zenitova. Sorbent for liquidation of oil spills on the basis of polyurethane foam and waste polystyrene. *Ecology and industry of Russia.* **2015**. No.4. P.42-46. (russian)

[11]   M.A. Ivanova, L.A. Zenitova. Purification of aqueous media from oil spills by sorbent on the basis of polyurethane foam and natural waste of Vietnam. Energoresursoektivnost and energy saving. XVI International Symposium. Proceedings of the Symposium. (March 15-17, 2016). *Kazan.* **2016**. (russian)