

THE UTILIZATION OF AGRICULTURAL WASTE TO PRODUCE OIL SORBENTS

G. ANNAYEV, S. F. YAKUBOUSKI, Y. A. BULAUKA

Polotsk State University, Novopolotsk, Belarus
u.bylavka@psu.by

Introduction. Today, about two hundred types of various sorbents are produced and used in the world for oil spills remediation, which in turn are subdivided into natural organic, inorganic and synthetic. The quality of sorbents is determined by their absorption capacity in relation to oil and oil products, buoyancy after oil sorption, the possibility of oil desorption, regeneration or utilization of the sorbent. The purpose of this study is to obtain natural sorption materials for the remediation of oil pollution by utilizing agricultural waste.

Materials and methods. Agricultural waste was used for the study, namely a mixture of husks of agricultural crops of the Liozno grain base; hulls of sunflower, peanut, buckwheat, barley, radish; cotton bolls; pericarp peas, beans, rapeseed. All samples are with a particle size of 0.25-1 mm. For them, the basic physical and chemical properties have been determined: humidity according to GOST 12597-67, bulk density according to GOST 16190-70, pH of the water extract according to GOST 32327-2013, adsorption activity for iodine according to GOST 6217-74, adsorption activity for methylene blue according to GOST 4453-74, pore volume by the "molecular probe" method according to GOST 17219-71 and oil capacity according to GOST 33627-2015.

Results. The moisture content in the selected samples is about 5% wt., which indicates a high ability to dry the samples; potentiometric titration established that the aqueous extract has a weakly acidic medium, and the bulk density of the samples averages about 100 g / 100 cm³, which is comparable with industrial sorption materials. The adsorption activity of the samples with respect to iodine is about 20%, and after treatment with a weak NaOH solution it increases by 30%. The adsorption activity for methylene blue, which indirectly characterizes the sorption capacity in relation to petroleum products, for the studied samples is about 100 mg / g (after treatment with an alkali solution it increases by more than 10%). Using the molecular probe method, it was found out that agricultural waste is characterized by a highly developed total porosity (the total pore volume in water reaches 1.5 cm³ / g) with a wide pore size distribution. The sorption capacity in relation to West Siberian oil (density at 20 °C: 860 g / cm³) is more than 3 g / g (after treatment of the samples with water and alkali solution it increases), i.e. the oil capacity of agricultural waste is higher than the economically effective value for industrial analogues. The value of the oil capacity of the mixture of agricultural husks in an unprocessed form surpasses the most widely used sorbent for the elimination of oil pollution Spill-Sorb (up to 9 g / g), while the cost of obtaining oil sorbents by utilizing agricultural waste does not exceed \$100 per ton.

Conclusion. Utilization of agricultural waste to produce oil sorbents will expand their range, reduce the burden on the environment and obtain an economic effect.