

GRANULAR RICE HUSK BASED SORBENTS FOR SORPTION OF VAPORS OF ORGANIC AND INORGANIC MATTERS

Almagul R.Kerimkulova^{1,2}, Seitkhan Azat^{1,2}, Leticia Velasco³, Zulkhair A. Mansurov^{1,2}, Peter Lodewyckx³, Marat I.Tulepov^{1,2}, , Makpal R.Kerimkulova¹, Inna Berezovskaya³, Aldan Imangazy²

¹ Institute of Combustion Problems, 172 Bogenbay batyr str.
Almaty, Republic of Kazakhstan
E-mail: seytkhan.azat@gmail.com

² Al-Farabi Kazakh National University, 71 Al-Farabi str.
Almaty, Republic of Kazakhstan
E-mail: almusha_84@mail.ru

³ Royal Military Academy, 8 Hobbema str., Brussels, Belgium
E-mail: leti_fv@hotmail.com

Received 22 February 2018

Accepted 11 January 2019

ABSTRACT

This article is dedicated to the development of a method for the manufacture of granulated carbon sorbents made of powdered rice husk (RH) and lignosulphonate (LS) aimed at absorption of organic and inorganic vapors. The microstructure analysis of the samples reveals that the activation promotes the formation of a higher amount of small pores and the development of a spongy texture of the sorbents leading to carbon content increase when compared to that of the initial sample. The final samples have apparent mesoporosity confirmed by the form of the isotherms referring to the low-temperature adsorption of nitrogen and the results of pore size distribution using the DFT method.

Keywords: sorption materials, nanostructure, toxic gases, rice husk, adsorption.

INTRODUCTION

Nowadays, the cleaning of aspiration and ventilation emissions from harmful substances is one of the main air protection measures for most of the industrial enterprises. The specific feature of most of the industrial emissions refers to the content of a large number of harmful gaseous components in addition to solid and liquid particles (dusts, gases, mists)[1, 2]. The cleaning of the gas flows from such contaminants requires corresponding knowledge of the theory to develop gas purification methods. The adsorption method becomes more and more valuable among other known methods of industrial emissions cleaning as it allows almost complete removal of the contaminations of the gas flows [3 - 5]. The solid materials of an extended surface made in form of granules (balls, pills, cylinders, etc.) or fine-grained materials are generally used as adsorbents [6 - 9].

Depending on their chemical composition there are carbon and mineral adsorbents. Active coals and

activated carbon fibers belong to the first group, while silicagels, aluminogels refer to the second one. The adsorptive properties and the capacity of these adsorbents to regenerate are determined, in general, by the chemical nature and the porosity of their surface. The highly developed surface is peculiar for highly porous substances, substances with a spongy structure or fine-grained ones. The leading role among all adsorbents used in practice belongs to different active coals (wood coal, bone coal, etc.) [10 - 14].

Many countries (Russia, USA, China, etc.) study intensively study the problem of air cleaning. The scientists from the Institute on Combustion Problems perform studies [15 - 17] connected with the manufacture of modified carbon adsorbents for medical applications, waste waters cleaning from heavy metals ions, biomolecules division, etc. But the elaboration of carbon sorbents for toxic gases sorption has not been studied so far. This omission is treated in the present communication.