

# **Development of activated carbons from waste cultivation of cotton in the Republic of the Union of Myanmar**

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## **INTRODUCTION**

The rapidly developing industrial production of the Republic of the Union of Myanmar—a state with predominance in the growing economy of the agricultural sector—is associated with an increase in environmental problems of protecting the biosphere from the negative effects of industrial wastewater, emissions into the atmosphere and solid waste. The solution to these problems is largely associated with the use of porous carbon adsorbents (active carbons). These materials are capable, upon contact with these objects, of effectively fixing the toxic organic impurities contained in them, thereby ensuring their deep neutralization and purification. However, Myanmar, whose numerous enterprises are in dire need of active (activated) coals, practically does not have its own production facilities, while meeting the needs for these adsorbents is hindered by high prices for them on the world market.

Along with this, the raw material base of the enterprises of the light and textile industries of the country is characterized by the presence of large-scale waste of plant nature, which does not find large-scale effective use, but can, judging by the available publications, served as the basis for the production of these adsorbents. Such waste includes, in particular, cotton stalks field, residues of cotton harvesting in the form of plant stems and rhizomes.

The Republic of the Union of Myanmar is not a leader in the world's cotton production and is not even among the top ten cotton production region, although it cultivates cotton for export and for its local used on a significant scale. With the husk plowed into the soil, a number of fungal diseases can be transmitted from vegetation to vegetation of cotton, which is very dangerous and harmful to the harvest of this technical crop, as the raw material base of light and textile industries. Taking into account this circumstance is associated with costly and environmentally unsafe operations of collecting, timely removal from plantations and elimination (burial, incineration) of these wastes.

Thus, in the Republic of the Union of Myanmar, the problems of scientific substantiation of the principles and development of methods for engineering protection of natural and artificial ecosystems from the impact of enterprises of light and textile industries are very relevant.

The implementation of our own production of adsorbents based on cheap waste of renewable plant raw materials can potentially contribute to solving the dual ecological problem of involving little utilized waste into the material circulation with the production of carbon adsorbents, focused on solving the ensemble of environmental problems of national industries. In this regard, it is important to organize and carry out research related to the efficient processing of

the waste of cotton stalks generated on the plantations of Myanmar.

### **Purpose and objectives of the study**

Development of waste management systems for the production and consumption of raw materials of light and textile industries using large-capacity field residues of cotton stalks formed on cotton plantations in Myanmar to obtain effective carbon adsorbents.

To achieve this goal, it was necessary to solve the following tasks:

1. To study the impact of waste from the raw material base and abiotic factors of technological processes for the production of light and textile products on the environment of natural and artificial ecosystems in order to minimize the anthropogenic impact;
2. Develop scientific and technical bases for processing large-capacity cotton stalks waste to produce adsorbents used for engineering protection of natural and artificial ecosystems;
3. Determine the main technological parameters of the key stages of obtaining adsorbents based on waste from the raw material base of the light and textile industries;
4. Evaluate the results of the applied use of the obtained carbon adsorbents in the treatment of a number of media and streams contaminated with toxic organic impurities;
5. To justify the hardware and technological scheme of the process of obtaining the adsorbent, and to develop its approximate feasibility study.

### **Scientific novelty**

In the work for the first time:

1. The possibility of using large – capacity waste from the raw material base of light and textile industries- cotton stalks, formed on the territory of Myanmar, for the engineering protection of natural and artificial ecosystems is shown;
2. The set of technological bases for obtaining new agents for effective carbon-adsorption purification and neutralization of liquid-phase flows in the form of industrial wastewater, process media and soil solutions is justified;
3. The values of the control parameters of the operations of pyrolysis of cotton stalks and activation by water vapor of the carbonizate obtained from this waste are determined, the regularities of their influence on the yield, the porous structure and the absorption capacity of the target products are established;
4. The features of the implementation, kinetic and equilibrium dependences of the processes of purification and neutralization of industrial discharges – wastewater, water technological and soil solutions contaminated with dangerous organic impurities, carbon adsorbents obtained from cotton stalks, in the engineering protection of natural ecosystems are revealed;

5. The increased ability of active coals based on cotton stalks to detoxify the soils of agricultural lands containing the remains of the herbicide atrazine (magazine) in the engineering protection of artificial ecosystems is justified;
6. The developed technological solutions are protected by a patent of the Russian Federation.

### **The practical significance of this research work**

1. Technical solutions have been developed to minimize the anthropogenic impact of raw material waste and abiotic factors of technological processes for the production of light and textile products on the environment of natural and artificial ecosystems in Myanmar;
2. Expanded understanding of the raw material base for the production of carbon adsorbents and the conditions for their production, contributing to this area of scientific and technical knowledge.

### **Provisions to be defended:**

1. Results of the study of minimizing the impact of abiotic factors of technological processes and enterprises of light and textile industries on the environment in natural and artificial conditions;
2. Scientific and technical basis for the production of new carbon adsorbents obtained by thermal processing of field residues of cotton cultivation (cotton stalks) according to the scheme of pyrolysis and activation of its carbonized products by water vapor;
3. The results of thermographic studies of samples cotton stalks and received from it the hydrocarbon in atmospheres of nitrogen and air;
4. Regularities of the influence of the values of the control parameters on the structural and adsorption characteristics and the yield of the target products of pyrolysis of raw materials and activation of its carbonizate by water vapor;
5. Conditions for the implementation of the pyrolysis and activation stages, ensuring the production of adsorbents with the specified properties;
6. Values of technical characteristics, target and by-products of thermal processing of cotton stalks for carbon adsorbents;
7. Kinetic and equilibrium regularities of the processes of cleaning and neutralization of a number of gas and liquid-phase objects with the obtained carbon adsorbents;
8. The basic technology of processing of cotton stalks for active coals and its hardware design;
9. Feasibility study of the production of 100 tons per year of active coals according to the developed technology and the results of the assessment of the avoidable damage, when implementing this production and using its products in the cultivation of this technical crop.