

## PRODUCTION OF HUMIC SUBSTANCES FROM ZAYSAN BROWN COAL

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### INTRODUCTION.

Humic substances play a major role in agricultural sector of Kazakhstan as one of the main fertilizers. Brown coal mined in Zaysan could be used as a feedstock to produce humates [1]. Various technologies of extraction of humic substances from coal have been developed, however, considering the complexity of the chemical composition of the Zaysan brown coal, these technologies need to be improved and adapted.

### MATERIALS AND METHODS.

In this research project, humic acids were obtained from activated coal samples by hydroxide and pyrophosphate methods. Activation was done using hydrochloric (HCl) and sulfuric (H<sub>2</sub>SO<sub>4</sub>) acids. Quantitative analysis shows that the optimal conditions that give the maximum yield of humic acids are activation by sulfuric acid with 1:8 ratio of solid to liquid phases, temperature of 40°C and extraction by pyrophosphate method.

Coal samples were prepared according to the state standard 10742-71. The coal samples were activated by HCl and H<sub>2</sub>SO<sub>4</sub> with solid to liquid ratio of 1:5, 1:8, and 1:10. The activation stage was performed at 25°C and 40°C. After the activation stage humic acids were extracted by hydroxide and pyrophosphate methods according to the state standard 9517-94.

### RESULTS AND DISCUSSION.

Activation by H<sub>2</sub>SO<sub>4</sub> results in a larger amount of acid extracted compared to HCl. The maximum amount of humic acids corresponds to activation at the ratio 1:8 and a temperature of 40°C. The pyrophosphate method yields larger amounts of humic acids compared to hydroxide method under the same conditions. Taking into account the insignificant difference in the results and that the hydroxide method is easier to perform and less time consuming, it could be concluded that this method is more suitable for humic acids production from Zaysan brown coal. The samples obtained were analyzed by IR spectrometry. Comparison of the obtained humic acids with the reference acid was made. Spectra of two samples have almost the same peaks with some negligible differences, which could be explained by the complex structure of the coal. The IR spectra obtained will be further analyzed in order to reach final conclusions.

### ACKNOWLEDGMENT

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### REFERENCES.:

1. Wang, Q., *et al.* (2008). Effects of supplemental humic substances on growth performance, blood characteristics and meat quality in finishing pigs. *Livestock Science*, 117(2): 270-274.