

## Study of humic acids and preparations based on them

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In this work have been presented the results of the investigation of humic acids obtained from Mongolian and Russian naturally-oxidized form of brown coal. Humic acids and their soluble salt (humates) have been characterized for elemental content, functional groups, biological activity and solution properties, like optical density, threshold of aggregation and viscosity. Several structural parameters were determined by FT-IR spectroscopy, gel chromatography. We found that soluble salt of the humic acids were able to stimulate the immune system of sick animals, especially on stimulation of transfer of O – lymphocyte to T and B – lymphocytes. Antioxidant properties of humic acid in the form of sodium salt relatively to living systems was investigated *in vitro* and *in vivo* condition. It was found antioxidant properties of humic substances consists in decreasing synthesis of malondialdehyde that is intermediate product of animal fat peroxidation. As a result, we could develop three commercial products to be used as plant growth stimulator (humic fertilizer); feed humic acid preparation named Humaton for animals and humic mud preparation for treatment of human skin disease. All these products were standardized and have been used. In cooperation with Federal Research Center of Coal and Coal Chemistry of Russian Academy of Sciences is also being carried out evaluation of the biological activity of native and modified humic substance (HP) in order to build a humic preparation to counteracting desertification. Studies have shown that the destructive alkylation and subsequent debituminating of initial coals changes the structural group composition of humic acids, increases the degree of aromaticity. It was established that the biological activity of HP is directly proportional to the following structural parameters: the degree of aromaticity  $f_a$ , the hydrophilic-hydrophobic parameter  $f_{hh}$ , and the parameter reflecting the ratio of aromatic and aliphatic fragments of organic mass of HP (aromaticity / aliphaticity)  $f_{ar} / al$ .

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