

**IR-SPECTROSCOPIC RESEARCH OF NEW MANUAL
PHOSPHORUS FERTILIZERS**

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Abstract: *in the present study, humic acid was extracted from a compost made from cattle manure. The interaction of the obtained humic acid with the mineralized mass and non-conforming sludge phosphates of the Central Kizilkum was studied. In this case, samples of the interaction of non-coded phosphorite and humic acid with various weight ratios (1: (0,2-2,0)) are prepared. The resulting samples were investigated by IR spectroscopic methods. The results of the study show that the interaction of humic acids with non-standard phosphorites produces calcium humates, monocalcium phosphates and dicalcium phosphates.*

Keywords: *humic acids, sludge phosphorites, mineralized mass, cattle manure, compost, organic fertilizers.*

**ИК-СПЕКТРОСКОПИЧЕСКОЕ ИССЛЕДОВАНИЕ НОВЫХ
НАВОЗНОФОСФОРНЫХ УДОБРЕНИЙ**

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Аннотация: *в настоящем исследовании гуминовая кислота была извлечена из компоста, приготовленного из навоза крупного рогатого скота. Изучено взаимодействие полученной гуминовой кислоты с минерализованной массой и шламовыми некондиционными фосфоритами Центрального Кызылкума. При этом готовятся образцы взаимодействия некондиционного фосфорита и гуминовой кислоты с различными весовыми соотношениями (1 : (0,2-2,0)). Полученные образцы были исследованы ИК-спектроскопическим методом. Результаты исследования показывают, что при взаимодействии гуминовых кислот с некондиционными фосфоритами образуются гуматы кальция, монокальцийфосфаты и дикальцийфосфаты.*

Ключевые слова: *гуминовые кислоты, шламовые фосфориты, минерализованная масса, навоз крупного рогатого скота, компост, органоминеральные удобрения.*

Soils of Uzbekistan in terms of the content of humic substances are low-income. The irrigated land fund of Uzbekistan consists mainly of gray soils, gray-meadow, takyр-meadow soils and to a lesser extent gray-brown and desert sandy soils. The humus content in them is relatively low; in the arable horizon, its amount varies from 1,2-0,8 (in gray soils, takyр and meadow) to 0,8-0,55 (in gray-brown and desert sand), while in the same horizon of chernozems of chestnut humus soils contains 2-4% [1]. The specific gravity of soils with a low humus content (0.8-1% in sierozems) is almost 2/3 of the area, with an average (1-1,2%) - 1/3, and with a high (1,2-1, 5% of the soil weight) - only 7% of the sown area [2]. Humus reserves in the meter soil layer of Uzbekistan are as follows (t / ha): light gray earth 82,8; typical serozem 78-79; typical bogar serozem 59,5; dark serozem 150,5; brown soil 318,6; meadow-bog soil 139,2 [3].

In the process of agricultural production using land, part of the humus in the soil is gradually mineralized with the release of nitrogen and other nutrients, which transform into a form assimilable to plants. In this case, the loss of humus may be 0,6-0,7 t / ha per year. With high yields of grain crops, the soil annually loses 0,5-1,0 t / ha of humus, while cultivating row crops, the loss of humus increases

to 1,5-3,0 t / ha. It was found that a decrease in humus content in the soil by 1% leads to a decrease in crop yields by about 5 centners of grain units per hectare [4-5].

In this work, to study the effect of humic acid on phosphorites, IR spectroscopic analyzes of the samples were performed. IR spectroscopic studies of the studied samples are prepared as follows. The starting materials are taken at a weight ratio of phosphorite : humic acids (HA) = 1: (0,2-2,0). Samples are placed in a porcelain mortar and crushed for 30 minutes. to a homogeneous mass, then add water to a moisture content of 70-75% and mix thoroughly, leave for a day, then dry to constant weight at a temperature of 80 °S.

IR spectra of the starting raw materials, HA and its products with PS were recorded on an Irtracrer 100 spectrometer (Shimadzu, Japan) in the frequency range 400–4000 sm^{-1} . Samples were prepared by compression with KBr. The results are shown in figures 1-5.

On the IR spectra of mineralized mass (MM) and sludge phosphates (SF), explicit absorption bands appear that correspond to antisymmetric stretching and deformation vibrations of the PO_4^{3-} ion in the frequency range 570–605 sm^{-1} and 1026–1066 sm^{-1} [96; p. 412, 97; p.248]. In the NF spectra, the oscillation frequency is 713; 875; 1427; sm^{-1} refers to carbonate - ion. In the region of 1041, 798, and 470 sm^{-1} , it is characteristic of stretching vibrations of Si – O – Si bonds of silicates. The substitution of the PO_4^{3-} ion in the fluoroapatite molecule by the CO_3^{2-} group can probably be judged by the shift of the maxima of the PO_4^{3-} vibrational band to the high-frequency region due to the overlap of the carbonate absorption band in the phosphate mineral. The absorption band of the PO_4^{3-} tetrahedron also overlaps with the absorption band of silicates (region 1041–1068 sm^{-1}). In the region of 1620 and 3529 sm^{-1} , there are absorption bands characteristic of stretching and deformation vibrations of crystallization water as well as water physically adsorbed on the grain surface of grains (Figs. 1 and 2).

In the IR spectrum of the HA, bands are observed that belong to the OH (1639 sm^{-1}), C – H (2920 sm^{-1} , 2850 sm^{-1}), and C = O (1701 sm^{-1}) groups. When comparing the IR spectra of the starting materials and the products of the interaction of HA and phosphorite, one can see that in the IR spectra the products of the interaction of the band are shifted to the low-frequency region (Fig. 3).

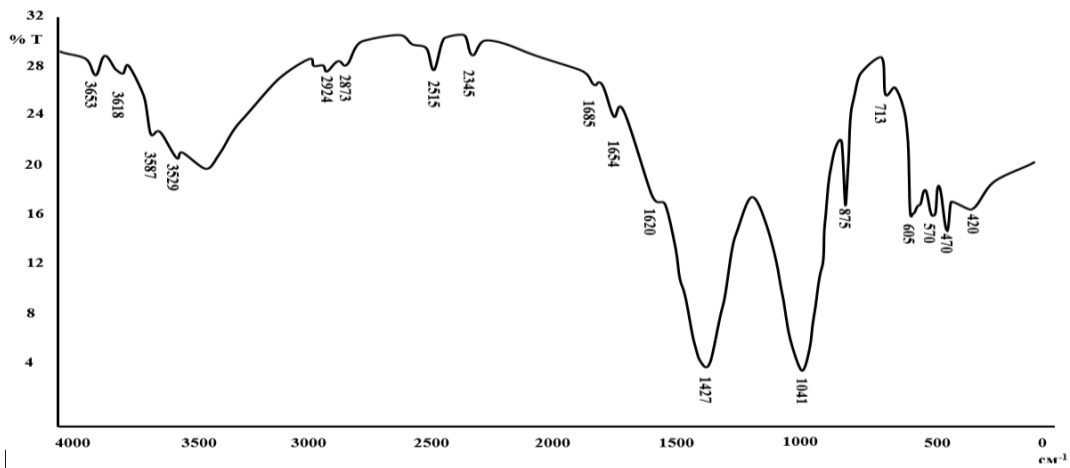


Fig. 1. IR spectrum of MM

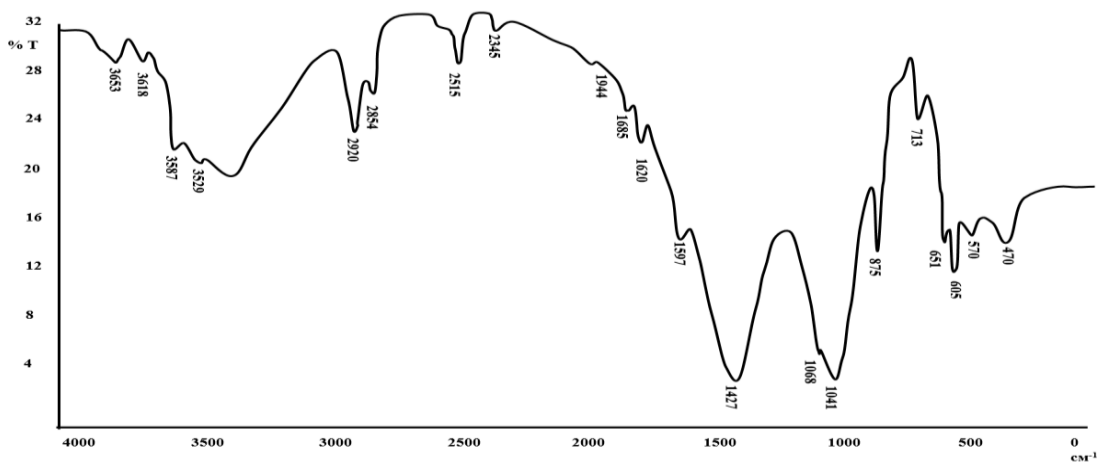


Fig. 2. IR spectrum of SF

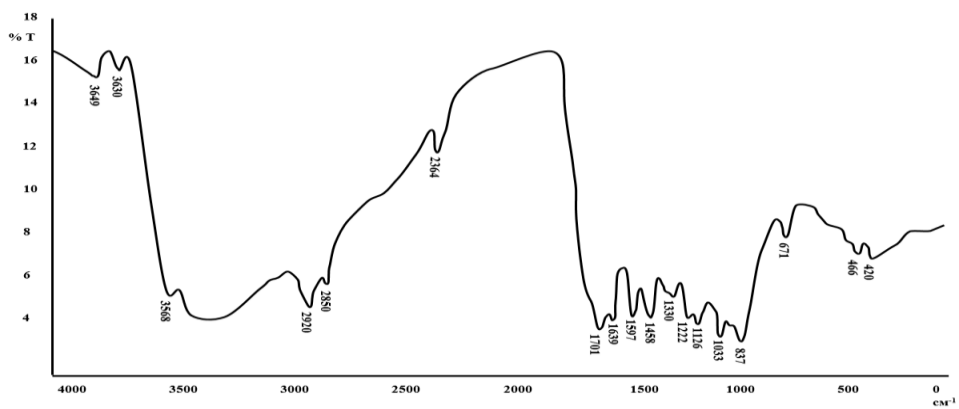


Fig. 3. IR spectrum of HA isolated from compost

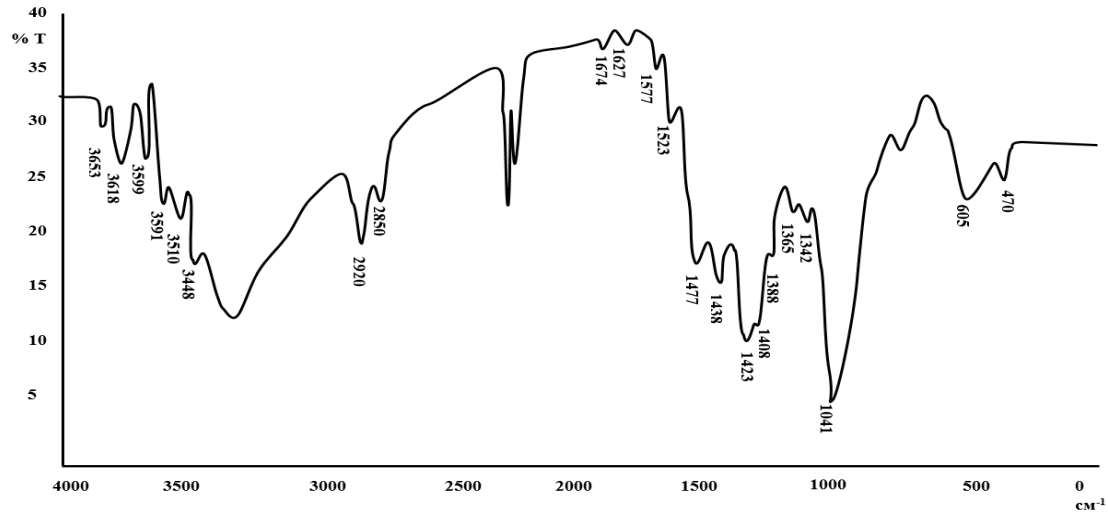


Fig. 4. IR spectrum of the product of the interaction of HA with MM

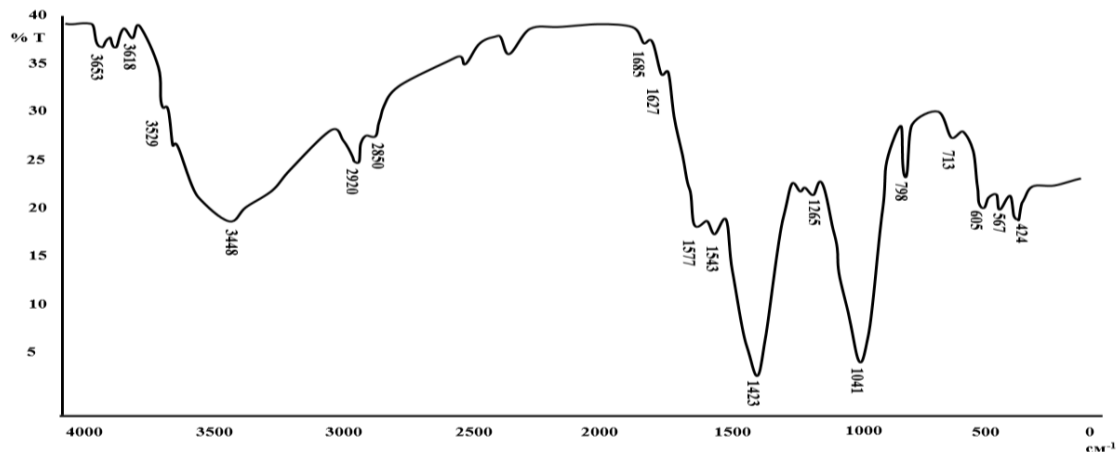


Fig. 5. IR spectrum of the products of the interaction of HA with SF

On the IR spectrum, a band of interaction products in the region 470; 570; 1330; 1427; 1685; 3568 cm^{-1} displaced to 424; 567; 1265; 1342; 1408; 1423; 1674; 3448 cm^{-1} , and in MM there is practically no band in 713; 875; 1620; 1427 cm^{-1} , which indicates a decrease in the number of carbonate compounds in the reaction products. In the IR spectra of the obtained interaction products, bands corresponding to 567 appear; 1265 cm^{-1} for monocalcium phosphate, 424; 567; 798; 1627; 1674 cm^{-1} - dicalcium phosphate. Also, bands with a frequency of 1523–1577 cm^{-1} corresponding to the carboxylate ion are shown (Figs. 4 and 5).

Based on chemical, IR spectroscopic studies of MM, SF, HA and their interaction products, we can draw certain conclusions that in the process of obtaining humic fertilizers based on substandard phosphorites and animal waste, an interaction occurs between humic acids and phosphorite with the formation of calcium humates, water - and digestible forms of phosphorus.

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