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A NEW METHOD OF SAVING WATER AND FERTILIZERS IN COTTON GROWING FROM RECYCLED PHOSPHOGYPSUM RAW MATERIALS

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НОВЫЙ МЕТОД ЭКОНОМИИ ВОДЫ И УДОБРЕНИЙ ПРИ ХЛОПКОВОДСТВЕ ИЗ ВТОРИЧНОГО ФОСФОГИПСОВОГО СЫРЬЯ

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ABSTRACT

Due to the lack of water resources in the countries of Central Asia and their decrease year by year, the wide use of water-saving technologies in agriculture is required. For example, in the agriculture of the Republic of Uzbekistan, large-scale works are being implemented in order to use water-saving technologies and reduce the consumption of mineral fertilizers in irrigating cotton plants. All the composite materials we offer are local, secondary raw materials of "Ammofos Maxam" JSC, phosphogypsum of "Maxam-Chirchik" JSC, urea formaldehyde resin (KFS) and Na-CMC produced in Namangan region were used. Modified interpolymer composite materials were used. And its physico-chemical properties were studied in the scanning electron microscope EV010SEM at the Center of Advanced Technologies. Tests of the new modified interpolymer composite materials on cotton plants were carried out at the educational and scientific experimental base of Chirchik State Pedagogical University and at the farm in Dostlik district of Jizzakh region, and positive results were achieved. Based on the obtained results, the consumption of water and mineral fertilizers has been significantly reduced, practically the expected result has been achieved and the correct conclusions have been reached in order to eliminate the shortcomings.

АННОТАЦИЯ

Ежегодное уменьшение водных ресурсов, как следствие их нехватка в Странах Центральной Азии требует увеличения широкого использования водосберегающих технологий в аграрном секторе экономики. В сельском хозяйстве Республики Узбекистан, например, реализуются масштабные работы по использованию водосберегающих технологий и снижению расхода минеральных удобрений при орошении хлопчатника. Предлагаемые авторами данной статьи композиционные материалы описываемого процесса являются местными, используется вторичное сырье АО «Аммофос Максам», фосфогипс АО «Максам-Чирчик», карбамидоформальдегидная смола (КФС) и Na-КМЦ производства Наманганской области. Исследования проводились на экспериментальной базе Чирчикского государственного педагогического университета, а также в фермерском хозяйстве Дустликского района Джизакской области. В ходе научной работы использовались модифицированные интерполимерные композиционные материалы. Авторами статьи получены положительные результаты, достигнута цель статьи и сделаны ценные выводы, направленные на устранение недостатков производственного процесса. Определены направления разработки научных исследований по технологиям крупного производства интерполимерных композиционных материалов, которые планируется проводить совместно с другими научно-исследовательскими институтами.

Keywords: urea-formaldehyde resin (UFR), sodium carboxymethylcellulose (CMC-Na), phosphogypsum PG interpolymer complex (IPC), porous composite material (PCM). EV010SEM scanning electron microscope

Ключевые слова: карбамидоформальдегидная смола (КФС), натрийкарбоксиметилцеллюлоза (КМЦ-Na), фосфогипс (ФГ), интерполимерный комплекс (ИПК), пористый композиционный материал (ПКМ). Сканирующий электронный микроскоп EV010SEM

Introduction. One of the main scientific directions developing in the Republic of Uzbekistan is secondary raw materials and their processing. Such works are based not only on the development of the chemical industry in the Republic of Uzbekistan, but also on the improvement of the ecological situation in our republic, and the use of secondary raw materials in the synthesis of useful products [2].

Secondary raw materials are called objects and materials that have served their service life waste generated during industrial processing. That it is much more important to convert waste into a new product through industrial reproduction.

Waste is called discarded substances or products that have not found practical application in this period of development of the chemical industry.

Waste recycling reduces electricity and water consumption by several times. For example, getting paper from waste paper not only reduces the felling of trees, but also reduces electricity consumption by three quarters.

At "Ammofos-Maxam" JSC, phosphoric acid is produced by decomposing phosphorous flour under the influence of sulfate and precipitating it as calcium sulfate dihydrate. When mixed with sulfuric acid, phosphorous flour, phosphoric acid is formed, and calcium sulfate is precipitated into dihydrate (pulp suspension). The decomposition of phosphorous flour occurs according to the equation:

$$Ca_5F\ /P0_4\ /_3 + 5H_2SO_4 + H_3PO_4 =$$
$$=5CaSO_4{\bullet}2H_2O + /n+3/\ H_3PO_4 + HF$$

The precipitate consists mainly of two-molecular aqueous calcium sulfate ($CaSO_4{\bullet}2H_2O$), consisting of a mixture of undecomposed phosphate, acidic phosphorus salts and silicates. The quantitative composition of the mixtures depends on the mineralogical composition of the feedstock, the degree of production and equipment adjustment, compliance with technological discipline, etc. [4.

Silicates easily decompose under the action of acid with the release of Na, K, Al and silicic acid ions into the solution.

Silicic acid interacts with hydrogen fluoride:

$$6HF + SiO_2 = H_2SiF_6 + 2H_2O$$

Over a solution of hydrofluoric acid h2sif6, the vapor viscosity increases with increasing temperature and concentration of h3po4. This leads to the fact that the amount of fluorinated gases released during the

decomposition of phosphates in different conditions of phosphoric acid production will not be the same:

$$H_2SiF_6 + SiO_2 + nH_3PO_4 = 3SiF_6 + nH_3PO_4$$

$$H_2SiF_6 + H_3PO_4 + = SiF_4 + 2HF + nH_3PO_4$$

Under the conditions of phosphoric acid production, SiF4 has a higher viscosity compared to HF, therefore, the released precipitate of fluorine silicic acid and H2SiF6 solution are formed in gases:

$$3SiF + nH2O = SiO2 + nH2O + H2SiF6$$

Studies show that the fluorine content in phosphogypsum does not exceed 0.1 – 0.4%. The humidity of phosphogypsum depends on the quality of the carousel vacuum filter and ranges from 30% to 40%.

The volume weight of wet phosphogypsum in the soft state ranges from 0.531 to 0.581 t/m3 and averages 0.556 t/m^3.

Phosphogypsum of Almalyk production Association “ammophos-Maxam" in appearance is a silky flaking gray, easily flaking material. It has a characteristic smell, the texture is soft, the texture is irregular, the structure consists of a single mineral, a sledgehammer consisting of a soft mass between a slightly wetter material. In the dried state, it is a fine powder [7].

Phosphogypsum used in our research is a product of JSC “ammophos-Maxam" in the city of Almalyk. Currently, the amount of phosphogypsum accumulated in the warehouses of secondary raw materials of JSC has exceeded 80 million tons, and this amount is increasing every year [6].

Metadology and methods of study

It is mainly used as an additive to technical plaster, technical plaster is used for the manufacture of various shapes, models, etc. Phosphogypsum consists mainly of gypsum with silica additives and contains a small amount of P_2O_5.

The following new result was obtained by studying the elemental composition of a phosphogypsum sample using an EV010SEM scanning electron microscope. That is, the head part of the sample placed in the cuvette of a scanning electron microscope was determined by the percentages of elements taken in spectrum 4 and spectrum 5:

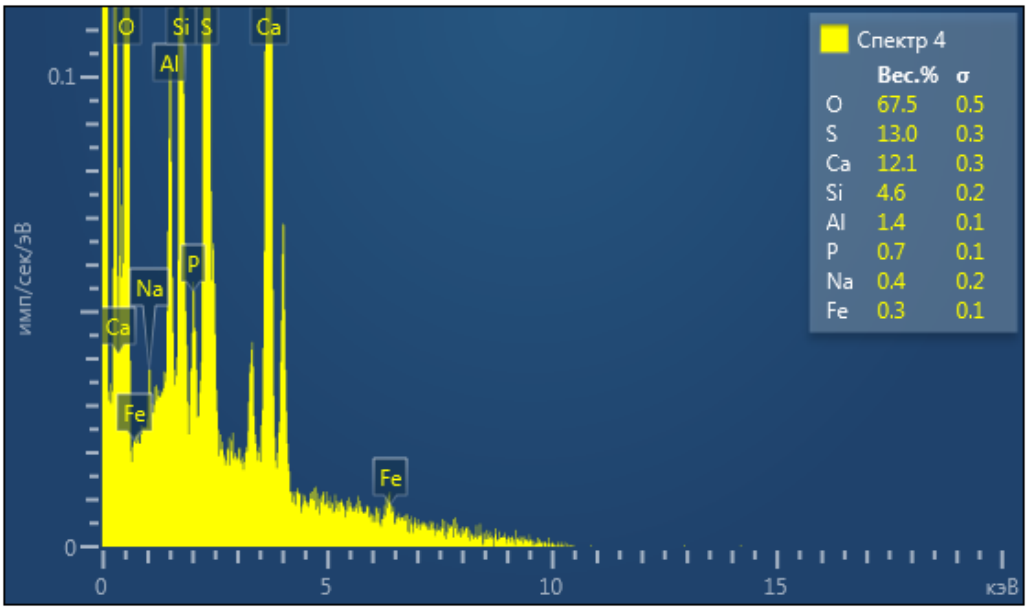

Figure 1. Percentage distribution of elements in an electron microscope

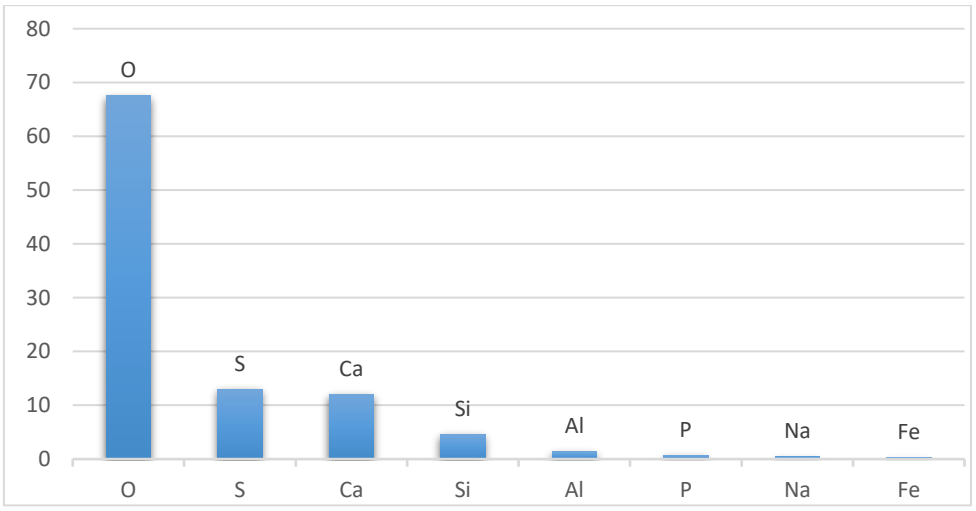

Figure 2. Oxygen element percentage

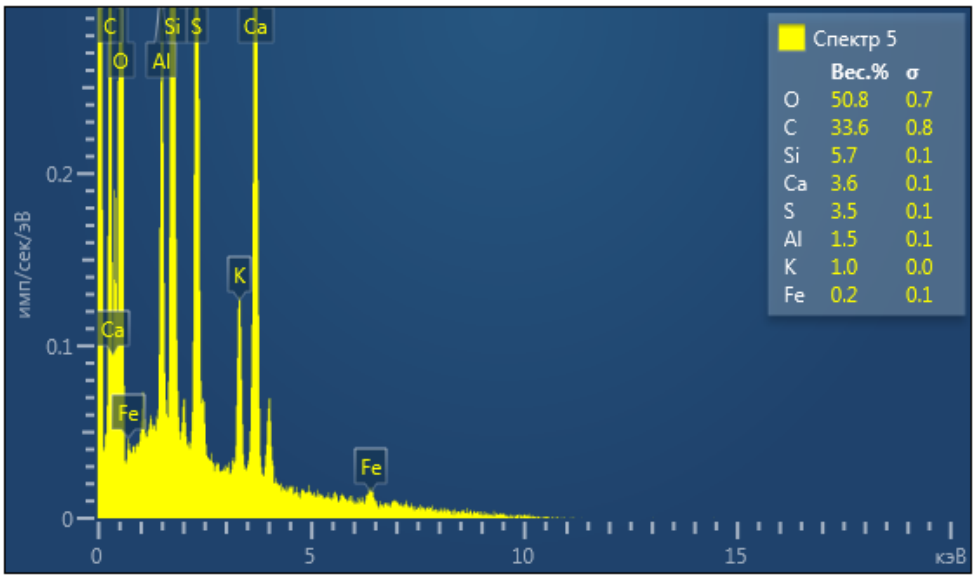

Figure 3. Percentage distribution of elements in an electron microscope

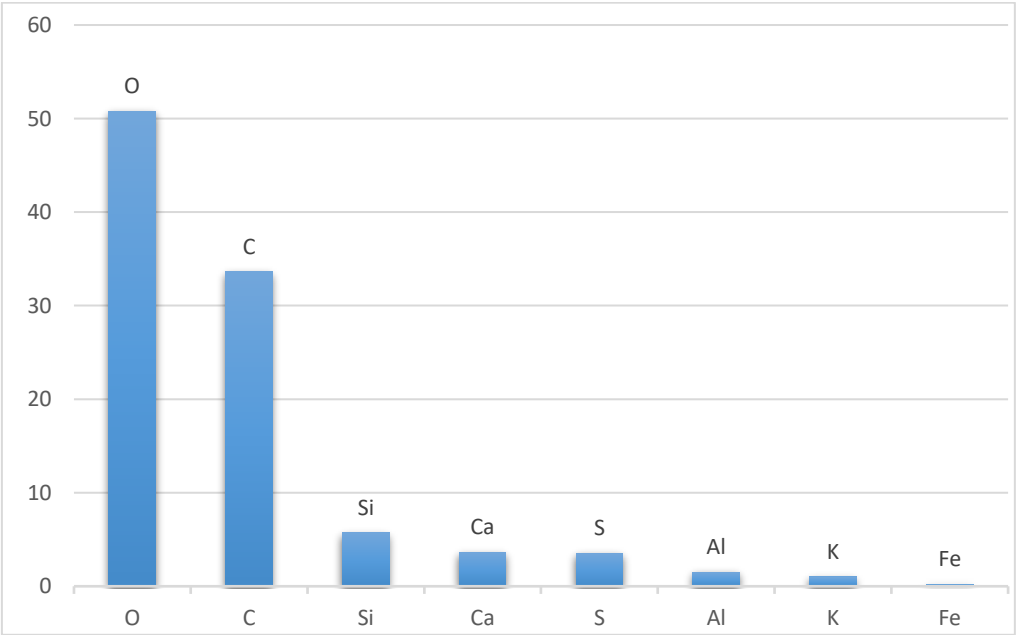

Figure 4. Oxygen element percentage

Scientific research and the search for practical solutions for the disposal of man-made waste, including secondary raw materials of phosphogypsum, are conducted in many European countries, the USA and Japan. Despite numerous studies and developments on the use of phosphogypsum, it has not yet been widely used in the national economy. In rare cases, the presence of radioactive elements from selectively mined ores makes it difficult to use phosphogypsum, and in some cases it becomes impossible, for example, with high radioactivity [2; 5; 6].

As a result of our research, our attention was attracted by the high content of macro- and microelements in the secondary raw materials of phosphogypsum, and the expected result was achieved by using it as a filler for composite material. To control the properties of the resulting composite material (cm), it is necessary:

- linear polymer-polymer (polyelectrolyte complexes PEK);
- linear polymer-compact particles it is recommended to use PPK.

The second component is used in two types: due to KFS and phosphogypsum.

The developed porous compositions allow solving the following problematic tasks:

- creation of an insulating coating such as a curtain (film), as well as an anti-filtration screen on the soil surface or in soil-based earthworks, in ditches or irrigation ditches, trenches, etc.;
- protective coating from sand on roads, in quarries, quarries, to reduce the movement of sand dunes, to form soil protection from water and wind erosion;
- creation of porous material with drip irrigation. Development of a new type of composite materials.

Discussion. The desired effect can be achieved by using this km in the current period of the market economy, using relatively inexpensive and economical methods of water use. For example, in the case of aboveground irrigation, which is the simplest irrigation method, it would be advisable if we reduced the irrigation rate by laying the screen underground for a certain part of the irrigation length to create an anti-absorbing screen. If in this way it is possible to save water supplied to the slope of the seeder, in addition, a wide opportunity will be provided to control the moistening erosion of the soil, that is, to keep it at a distance to the required depth.

Figure 5. Composite small trays. The process of watering cotton seedlings planted in two rows using an IPK irrigation device

As for the advantages of this method, it is relatively inexpensive compared to the methods of drip or rain irrigation used abroad and consists in the fact that its constituent elements are produced at chemical plants in our republic.

The essence of this idea is: processing in laboratory conditions of local phosphogypsum waste occupying hectares in the form of millions of tons of waste polluting air, surface and groundwater, and synthesis on their basis of interpolymer complexes and their polymer composite materials, as well as the production of these materials in the form of water-efficient equipment in agriculture. As a result of the fact that the irrigator continuously passes water through itself in a regular mode, firstly, water is consumed almost exclusively for the needs of the plant, as a result of which minerals in the soil are not washed out and are not absorbed by the plant. Secondly, as a result of unnecessary ingress of water, the probability of germination of weed seeds in the soil is reduced and the protection of the Husk from weeds is ensured. A significant part of the fertilizers applied to conventional watering elderberries are also absorbed by weed plants. On the other hand, our watering can ensures that only the appropriate plant will be fertilized during the fertilization process.

Conclusion. PCM based on CFGS - CMC (IPK - phosphogypsum and sand) showed that the components are evenly distributed and have a sufficiently homogeneous structure. The simultaneous formation of two complexes and the processes of CPS polycondensation, the properties of IPC and PCM not only complement each other, but also strengthen each other. This significantly improves the physico-mechanical properties of PCM, which, in turn, allows such PCM to be used in a wide range of irrigation applications.

The specific effective activity of natural radionuclides was determined for aged phosphogypsum samples, on the basis of which it was concluded that the specific activity of the phosphogypsum sample does not exceed standard values (SanPin No. 0134-03. "Epidemiological requirements for ensuring sanitary and radiation safety") and can be used without restrictions in economic activity.

Due to the large deposits of phosphogypsum (several million tons), man-made waste, availability, easy opening and the availability of the necessary infrastructure in existing factories, it is a promising source of calcium, phosphorus and other elements.

by processing phosphogypsum, it is possible to obtain PCM-locks necessary for several thousand hectares of irrigated agricultural fields in the saline regions of Uzbekistan. Based on this, on the basis of large tons of waste from the production of phosphogypsum, i.e. using it as raw material for production in the national economy, a more specific task is set. It was found that the developed interpolymer materials with a large amount of carboxymethylcellulose sodium salt as high-swelling hydrogels and waterproof screens, with an abundance of urea-formaldehyde resin and dispersed fillers to save irrigation water (uniform distribution of water) can be used. the length of the irrigation furrow). It was confirmed that they have a role in saving water and increasing cotton productivity.

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