Nanobiotechnologies and chemical technologies

Nanoporous Organo-Mineral Fertilizers obtained by using of Granule Shell Technology

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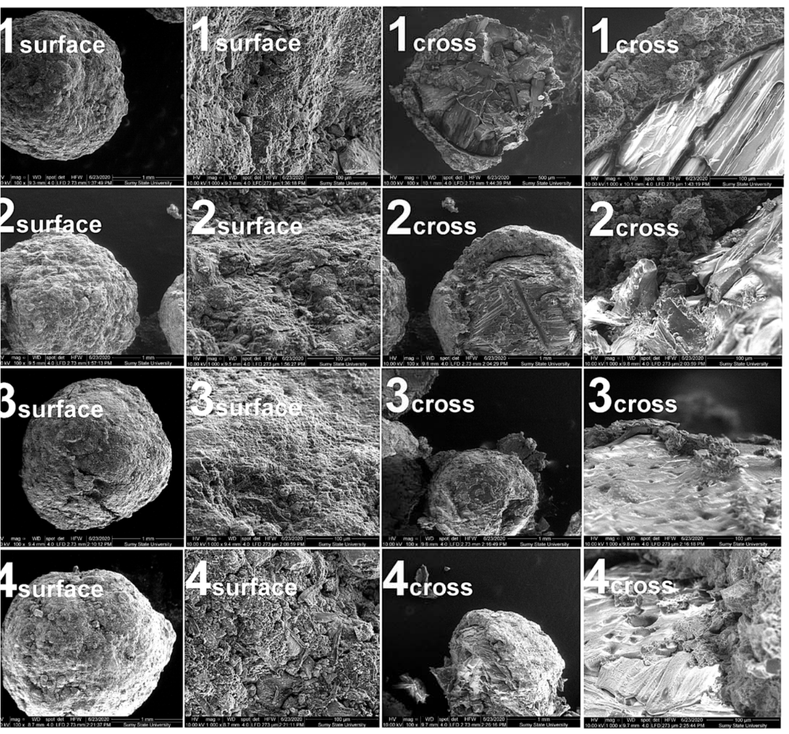
It is known that the fertilizers with different compositions of shell coatings allow decreasing of environmental pollution by nitrates due to the decreasing of solubility of N-containing nucleus of the granule [1]. In this work the investigations of mineral N-containing fertilizers with phosphorite-based porous shell are presented. Carbamide granules, that are most important and widely used N-fertilizer in the world today, because of high content of N and the absence of acidic influence on the soil.



.1. *General view of granules for samples* 1-4: a – general view of granule at magnification x100, surface of granule at magnification x1000; c- general view of granule cross section at gnification x100; d – cross section of the granule at magnification x1000.

Sample number	Composition P_2O_5, %	N, %	K_2O, %	Plasticizer	Granule strength, MPa
Sample 1	7,2	23,8	0,31	Calcium humate	2,1
Sample 2	7,13	23,6	0,21	Potassium humate	2,07
Sample 3	7,84	21,8	0,42	Potassium-magnesium	2,09
Sample 4 With microelement compex AVATAR	7,4	22,8	0,21	Calcium humate	1,71

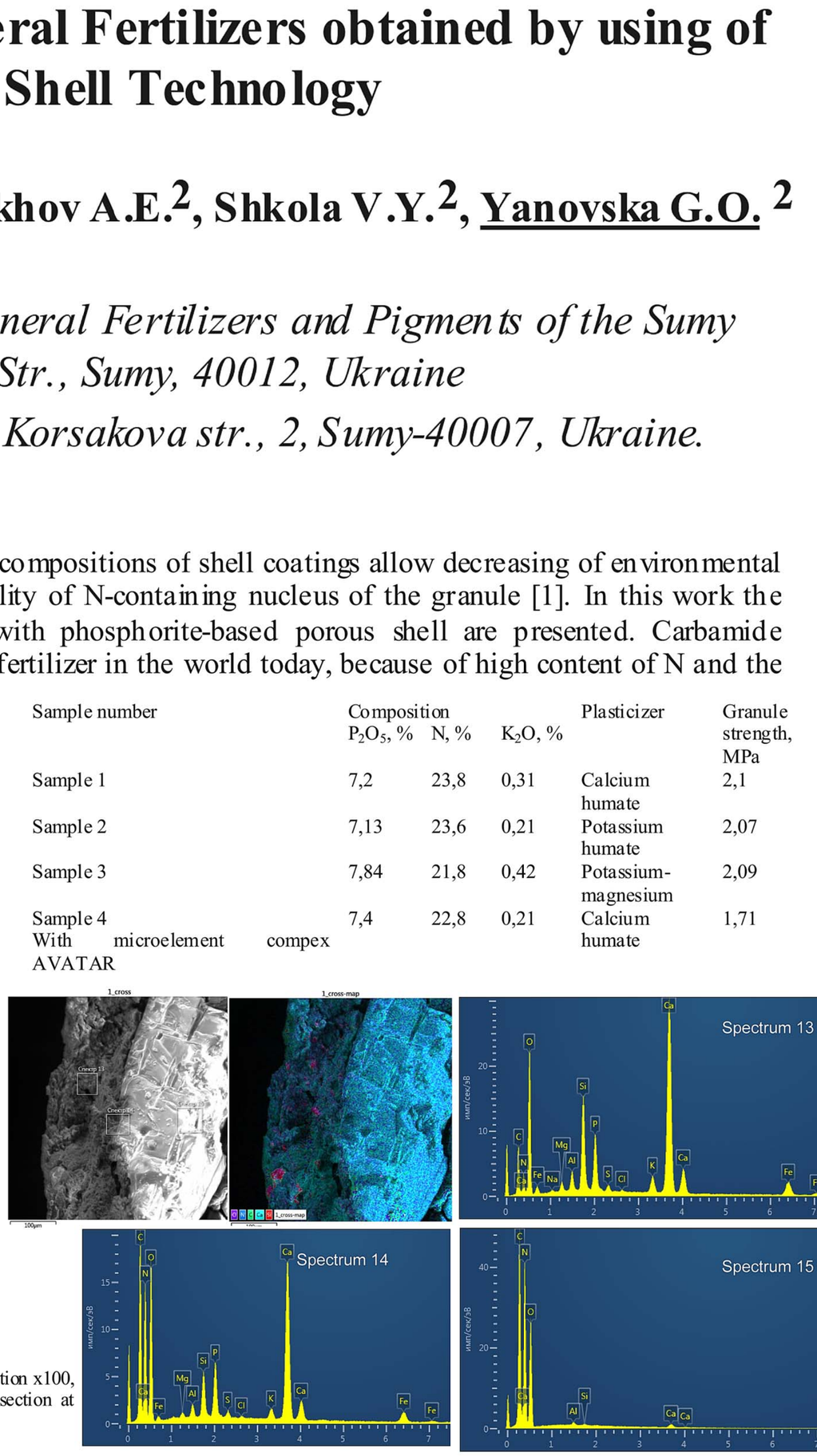


Fig.2. *EDX analysis of granules for sample* 1: element composition of granule cross section at thr points (surface – spectrum 13, interface – spectrum 14, nucleus – spectrum 15.

To obtain phosphate-containing shell the phosphate-glauconite centrate obtained from the Karpivski deposits together with phosphorite of the rchnekamsk concentrate with additions of microelements in chelate form and cium humate were used. The last one was used as plasticizer because of its slow ubility and positive impact into formation of agronomically valuable, water istant soil structure. Calcium addition neutralizes soil acidity and decreases the s of mineral components by the soil. The use of zeolite is necessary because of ir ability to decrease gaseous and infiltrate loss of nitrogen and increase amount potassium and productive humidity in the soil.

Relation of coating mass to the mass of granule nucleus was calculated. Dependence of coatings porosity from granulation parameters and temperature of granulation were estimated. The pore size and shape, surface porosity mainly depends on amount of plasticizer and rolling time of granules. Obtained carbamide granules with phosphorite-based porous shell have micropores with the size up to 10 nm.

1. *Gurets L., Vakal V., Vakal S.* Development of superphosphate based shells for the production of capsulated environmentally safe fertilizers // Environmental problems. -2018.**-3(4).**-P. 236-240.

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