

Granulation unit for modification and obtaining of ammonium nitrate with nanoporous structure: the basics of calculation and design

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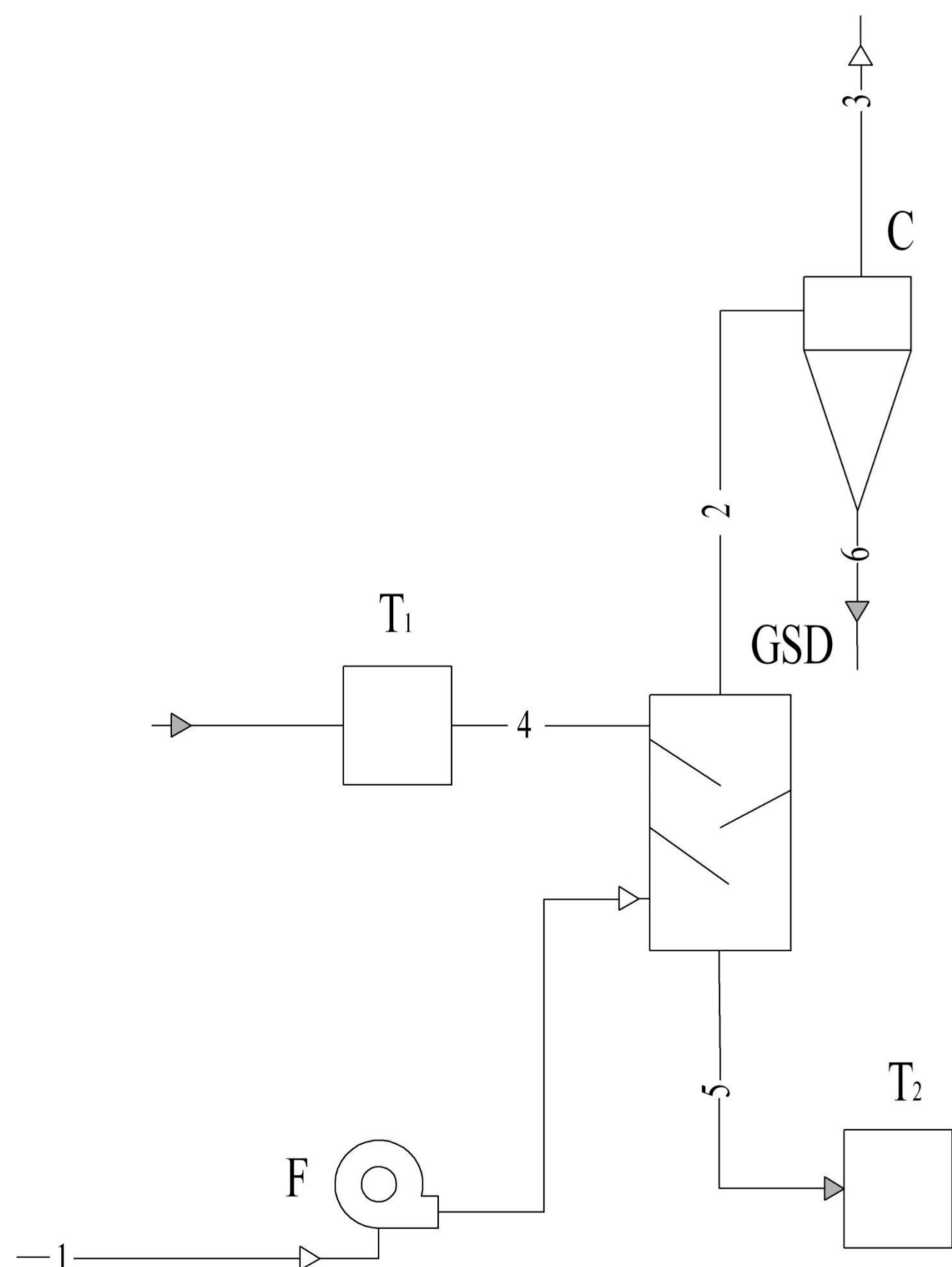
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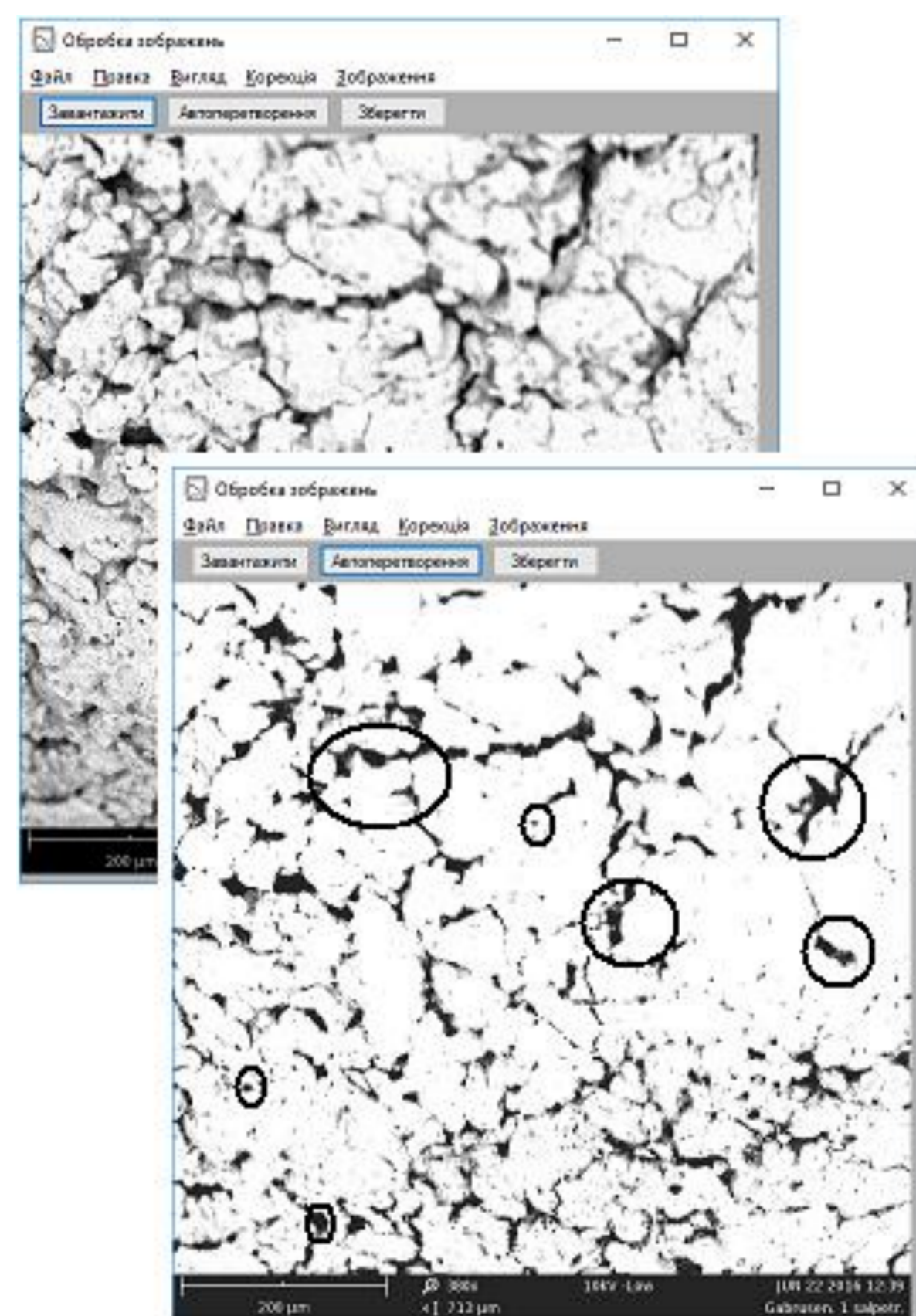
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Abstract – the work is devoted to the description of the algorithm for obtaining granules of porous ammonium nitrate in granulation plants using devices with different configurations of the fluidized bed. Brief theoretical foundations for calculating the main equipment of the granulation plant are presented. The design of individual units for the sequential implementation of the main stages of modification of ammonium nitrate to obtain a nanostructured porous surface layer is proposed. An assessment of the quality of the nanoporous structure of ammonium nitrate is carried out and further ways of improving the technology are shown.

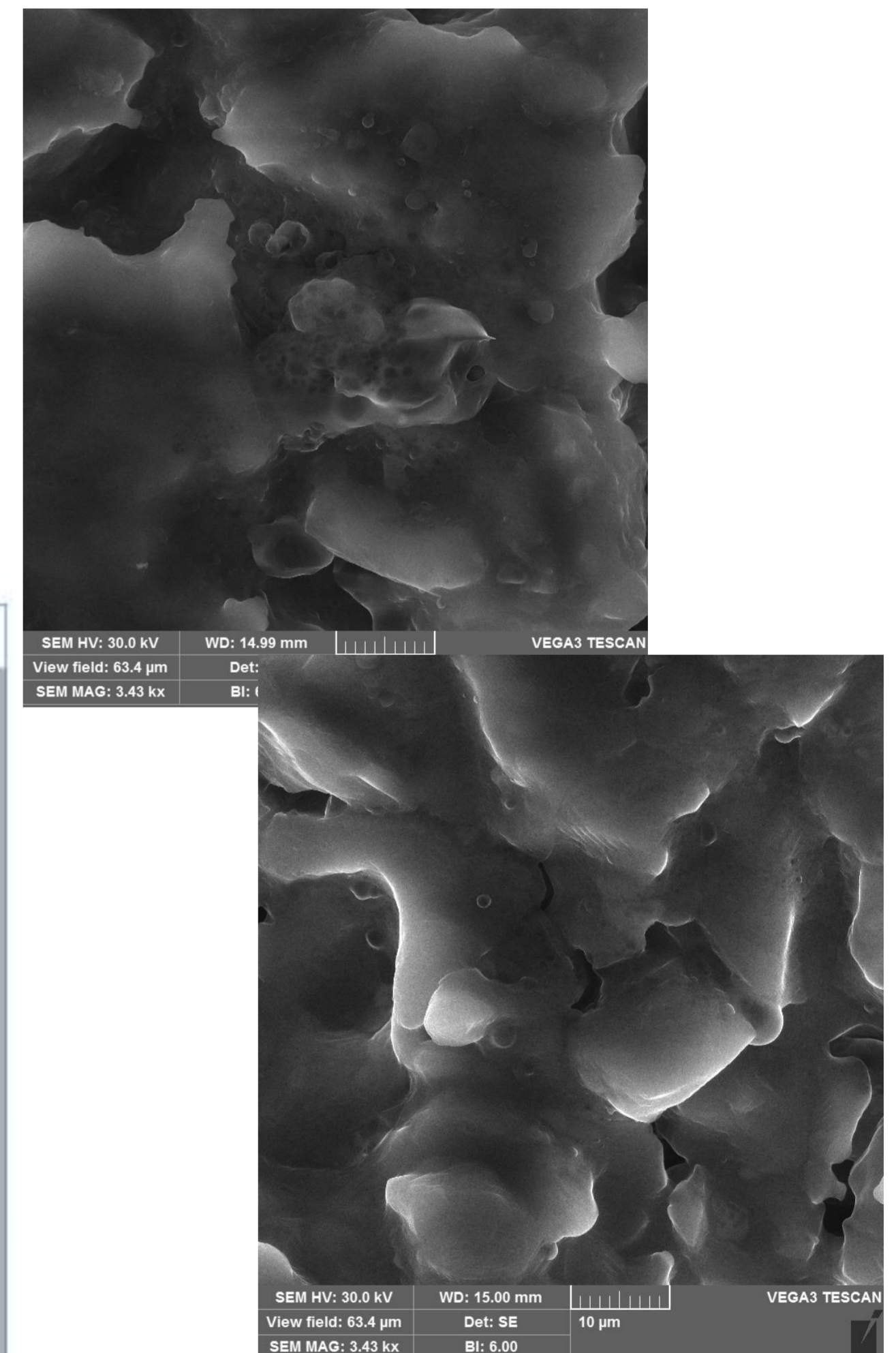
Keywords - Nanoporous structure, Multistage shelf dryer, Final drying, Porous ammonium nitrate



Schematic diagram of the experimental setup for the shelf dryer: F – fan; GSD – gravitational shelf unit; C – cyclone; T₁, T₂ – containers (tanks); 1 – drying agent; 2 – waste drying agent; 3 – purified gas; 4 – PAN; 5 – PAN after final drying; 6 – fine particles



Interface of the program Converter Image[©] for study of the nanoporous structure



Results of the granule inner structure microscopy after final drying in the gravitational shelf dryer

Effect of hydrodynamic mode of final drying in gravitational shelf dryer on granule's structure and quality (humidifier on the stage of treatment in vortex granulator – solution of ammonium nitrate)

Hydrodynamic mode	Absorptivity, %	Retentivity, %	The ratio of the number of the modified pores to the total number of pores ("modified"+ "mechanical")
The initial granules (after vortex granulator) before final drying	11.4	8.7	0.79
Gravitational falling layer	11.4	8.8	0.8
Transition mode	11.5	9	0.83
Moving fluidized bed	12	9.6	0.87