

# Final drying of ammonium nitrate with nanoporous structure in Theoretical basics of final drying of ammonium nitrate with nanoporous structure in gravitational shelf dryers

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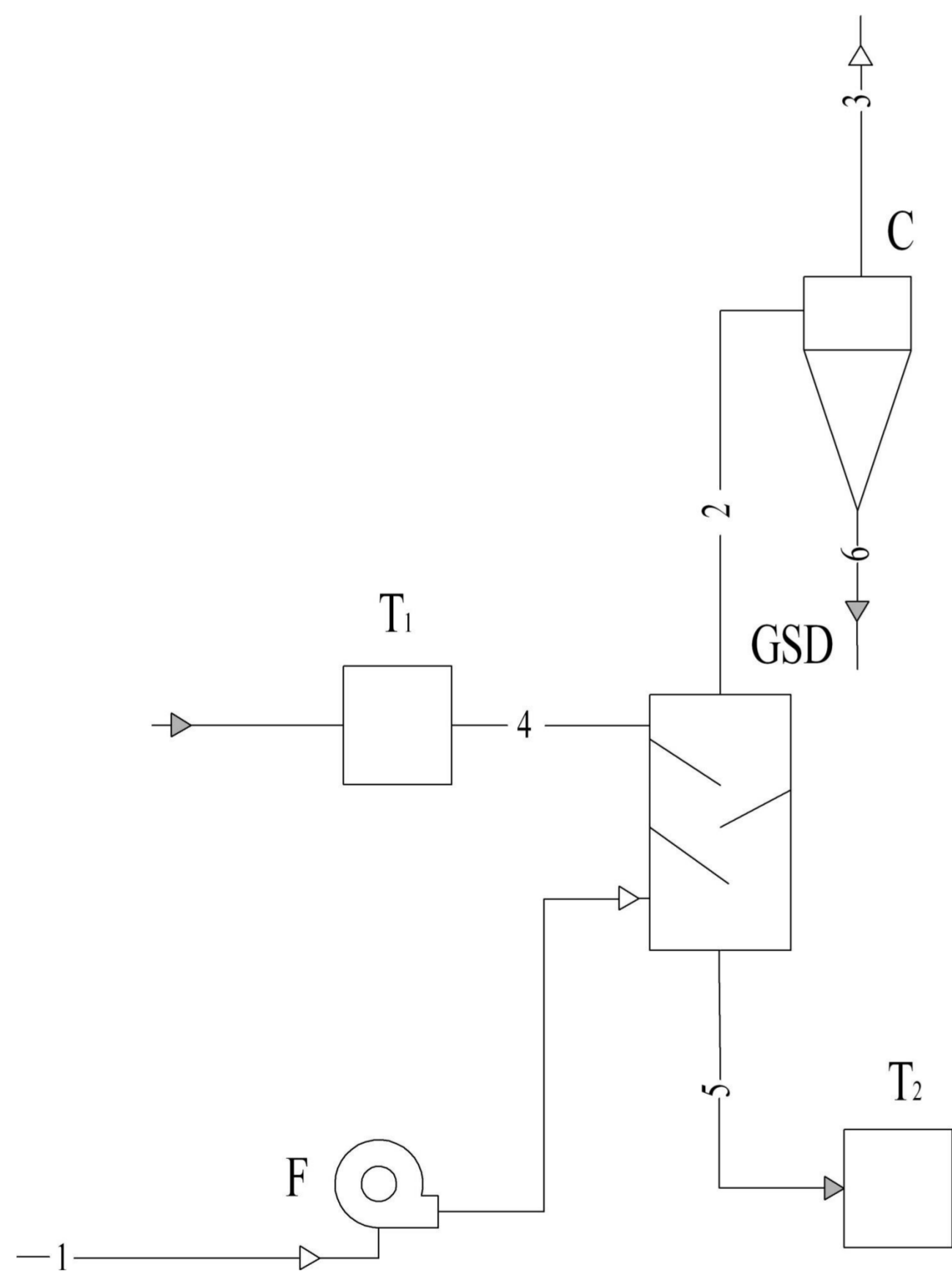
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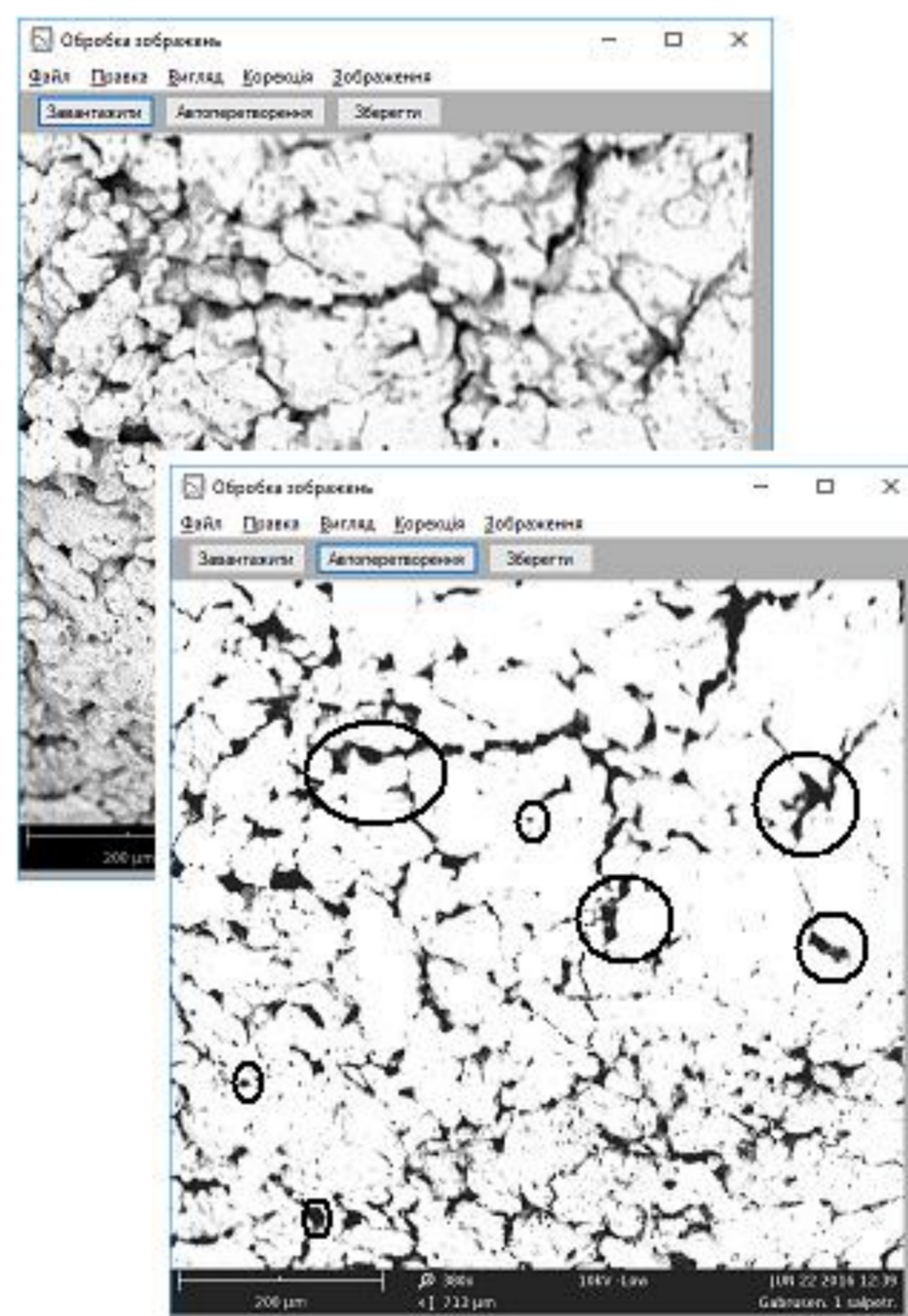
**Abstract** - the work is devoted to the study of the theoretical basics of convective drying of porous ammonium nitrate granules with nanostructured porous layers in multistage gravitational devices. A theoretical description of the drying kinetics of porous ammonium nitrate granules with nanoporous layers was presented.

The calculation of the drying process by the mass transfer equation has some peculiarities because there is an interconnected heat transfer in the drying objects: removal of moisture and simultaneous heating of the wet material. The relationship between these processes is because mass transfer coefficients depend on temperature, and thermal ones on the concentration of moisture in the material.

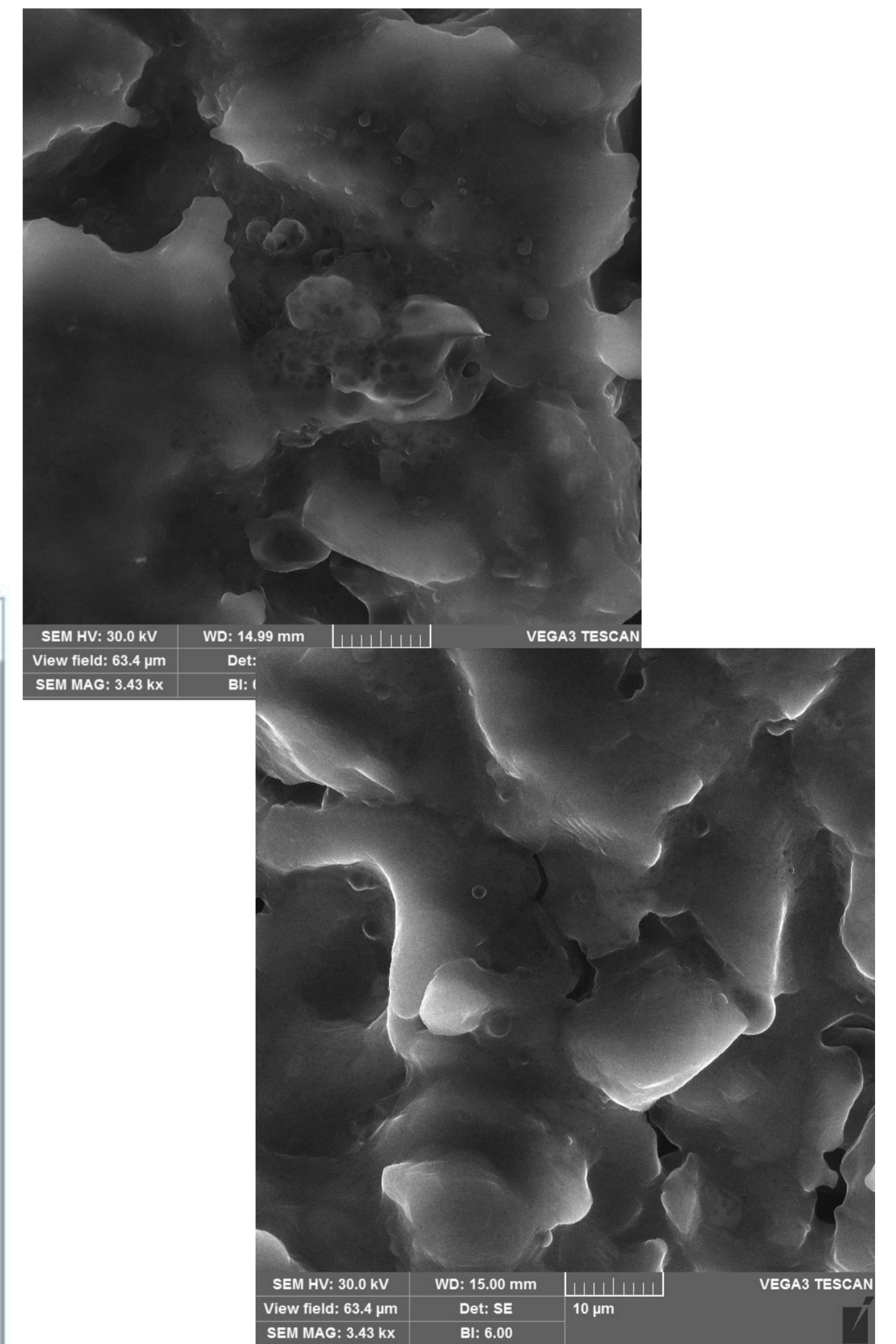
**Keywords** - Nanoporous structure, Multistage shelf dryer, Final drying, Porous ammonium nitrate



**Schematic diagram of the experimental setup for the shelf dryer:** F – fan; GSD – gravitational shelf unit; C – cyclone; T<sub>1</sub>, T<sub>2</sub> – 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<sup>©</sup> 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