

Influence of temperature factor on the properties of silver nanoparticles and their bio-activity in vitro



Lytvyn S.Ye.¹, Kurapov Yu.A.¹, Ruban N.M.², Didikin G.G.¹, Boretskii V.V.¹, Churkina L. N.³

Methods:
EB PVD
Annealing
TEM
EDP
XRD
DLS
TGA
S.aureus

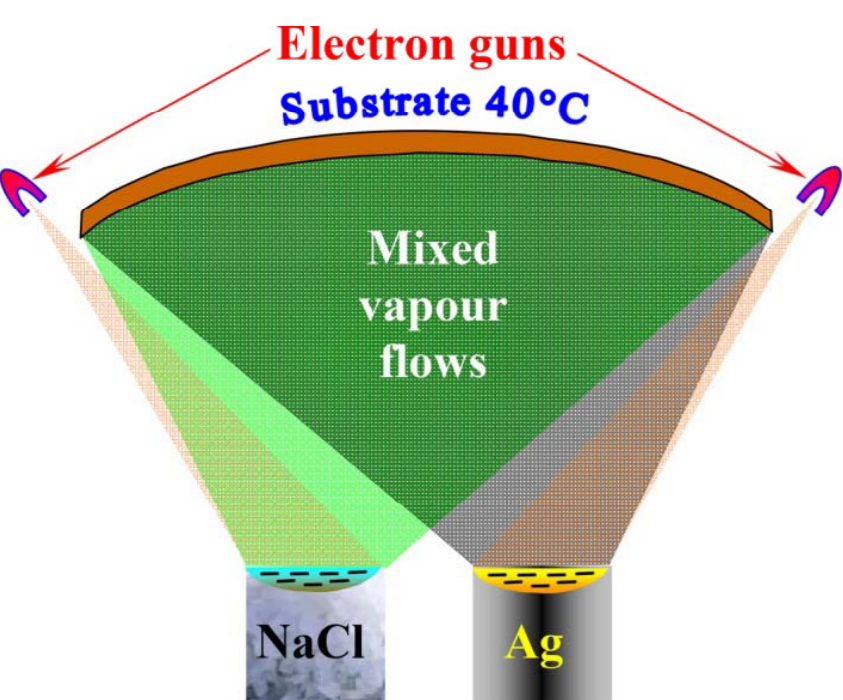
¹ E.O. Paton Electric Welding Institute of NAS of Ukraine, Kyiv
lytvynse@hotmail.com

² L. V. Gromashevskii Institute of Epidemiology and Infectious Diseases of the NAMS of Ukraine, Kyiv

³ Danylo Zabolotny Institute of Microbiology and Virology of the NAS of Ukraine, Kyiv

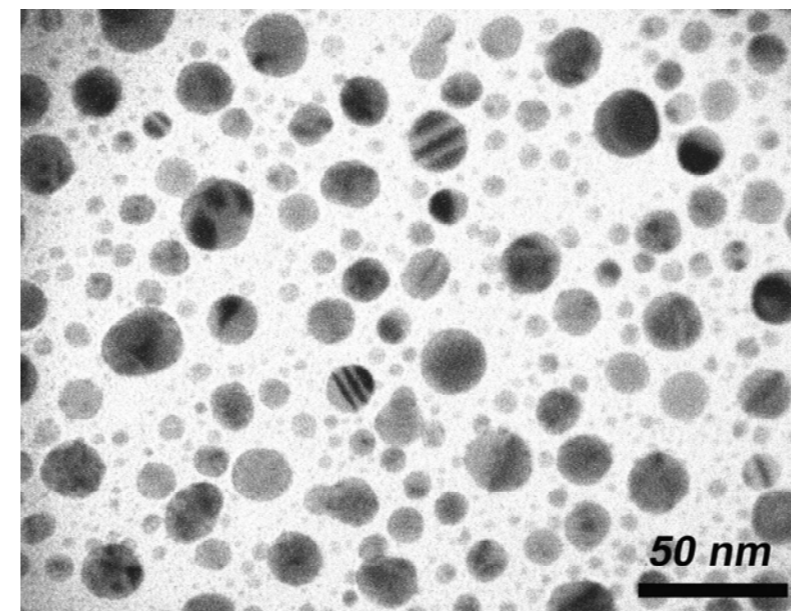
Material:
EB PVD
condensate
Ag-NaCl

EB PVD



Physical synthesis of silver nanoparticles (NPs) by the method of condensation of mixed molecular flows in vacuum (EB PVD) allows obtaining nanostructured material (16 wt. % Ag-NaCl) in the form of a dry substance (silver NPs in a water-soluble matrix), which allows preserving, storing and transporting the nanoparticles.

TEM



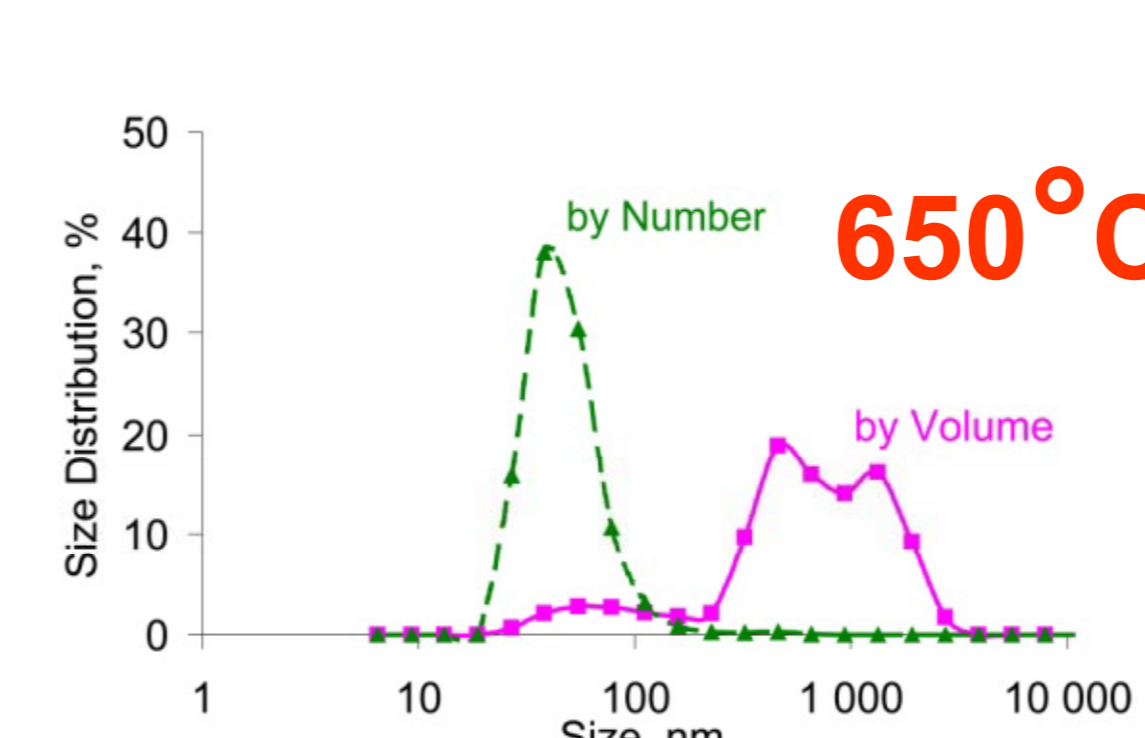
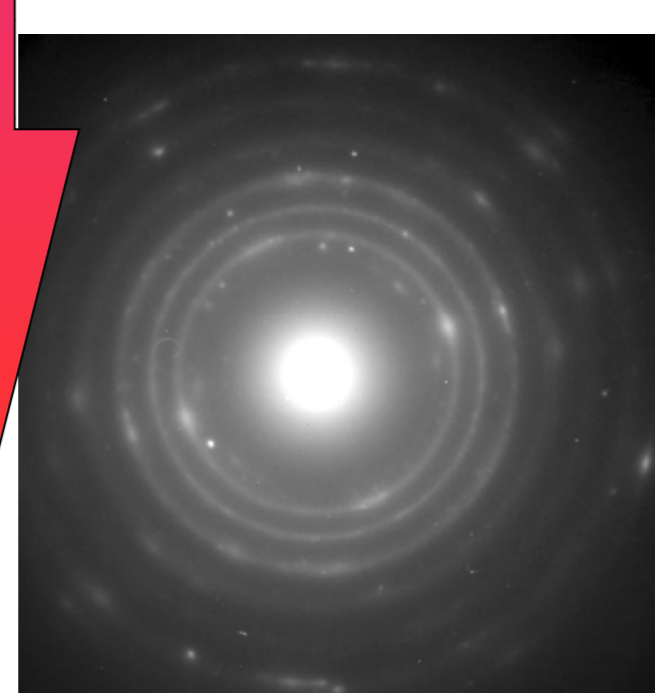
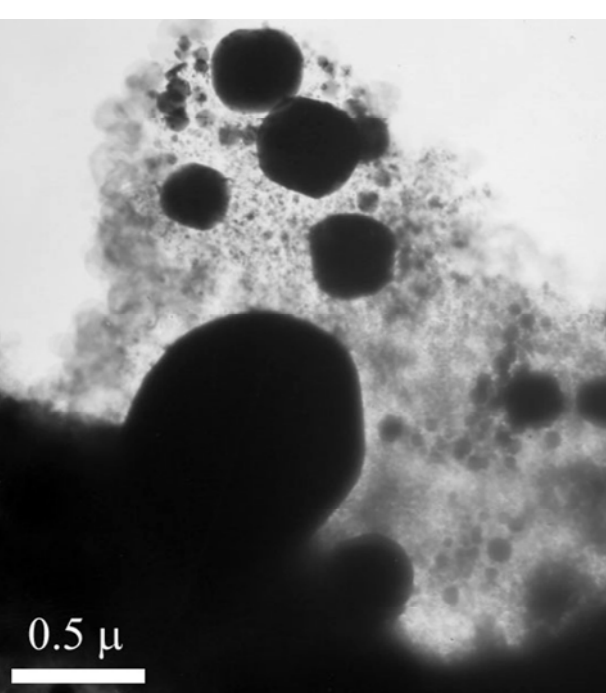
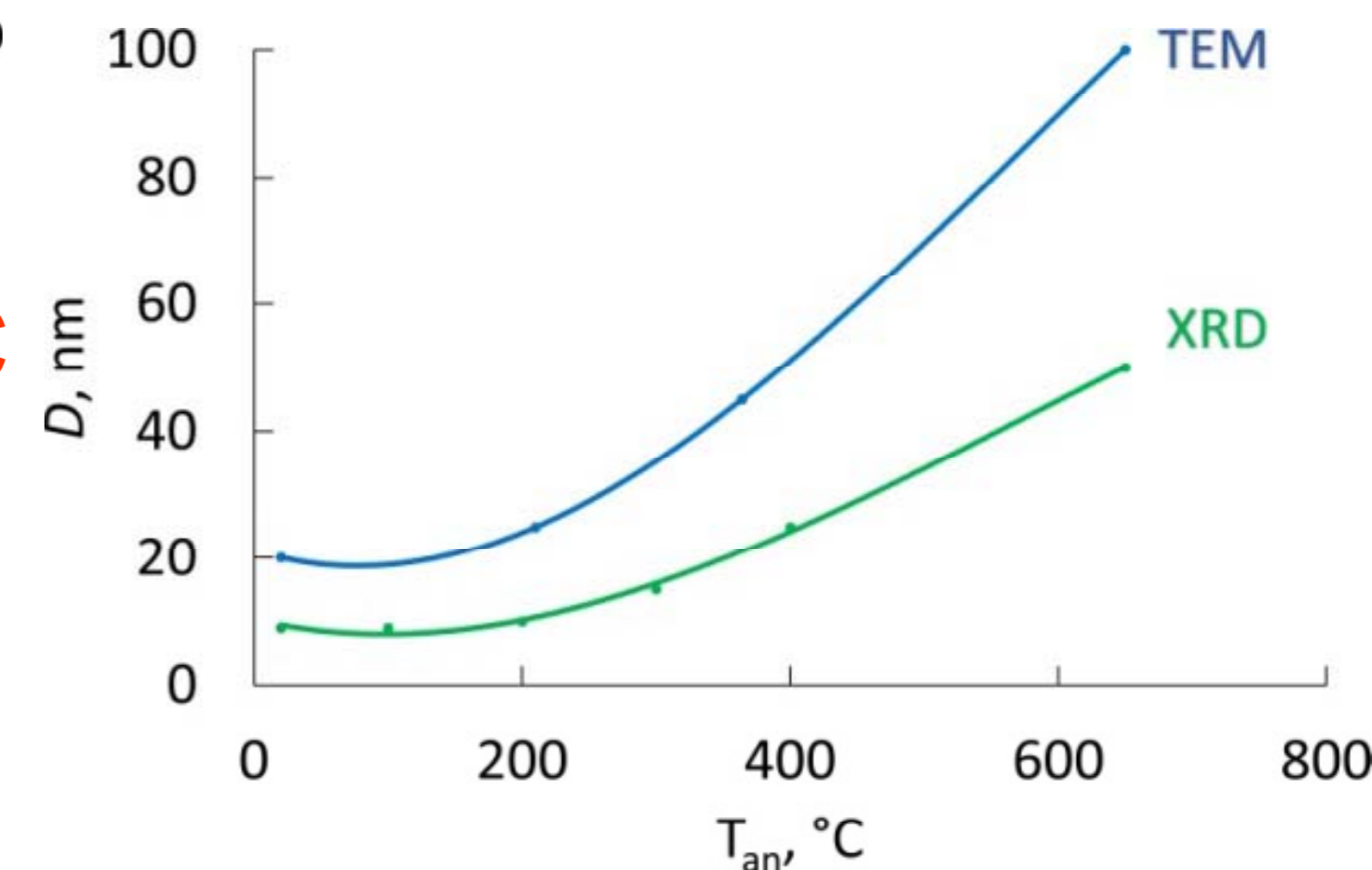
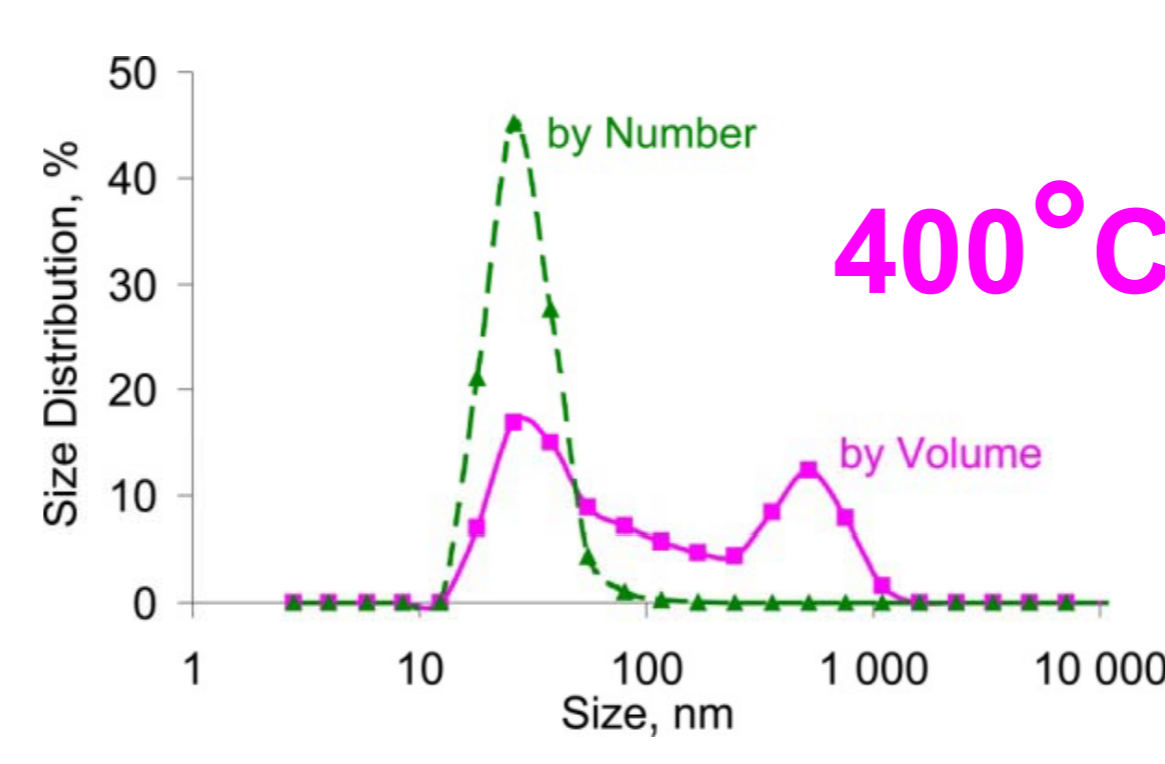
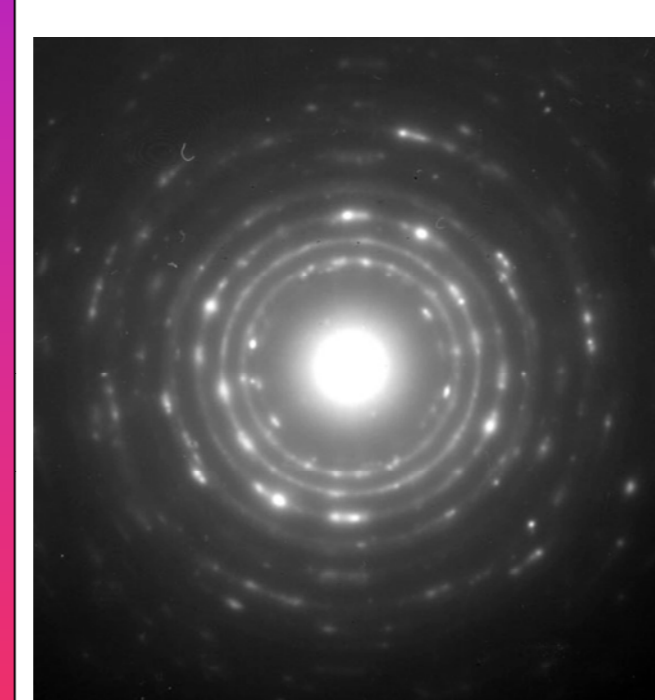
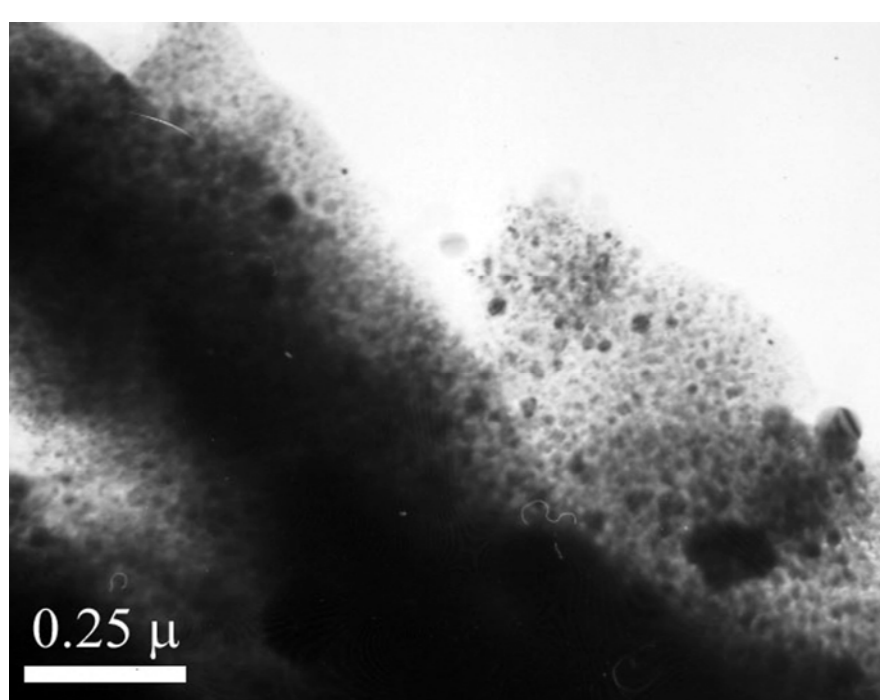
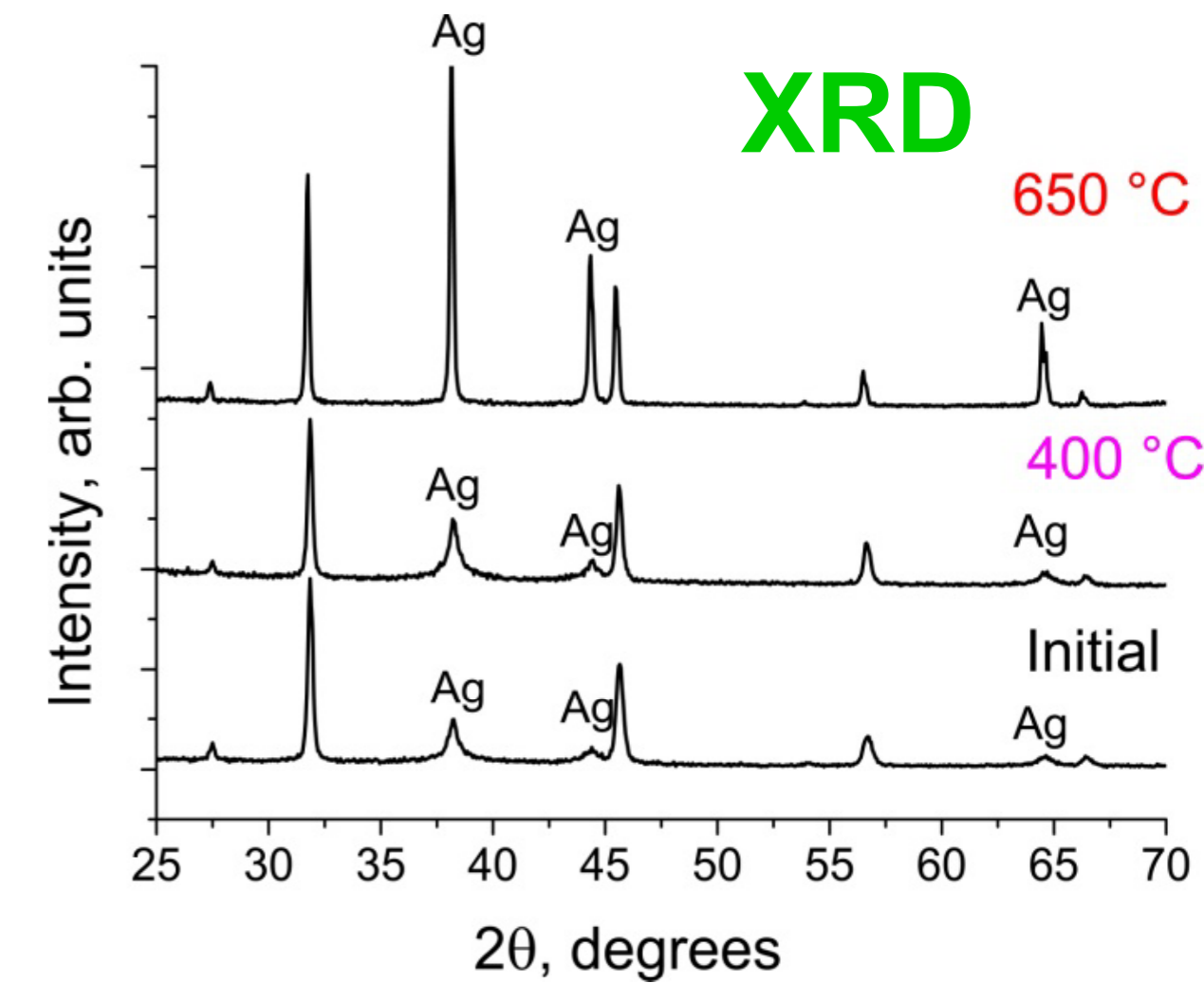
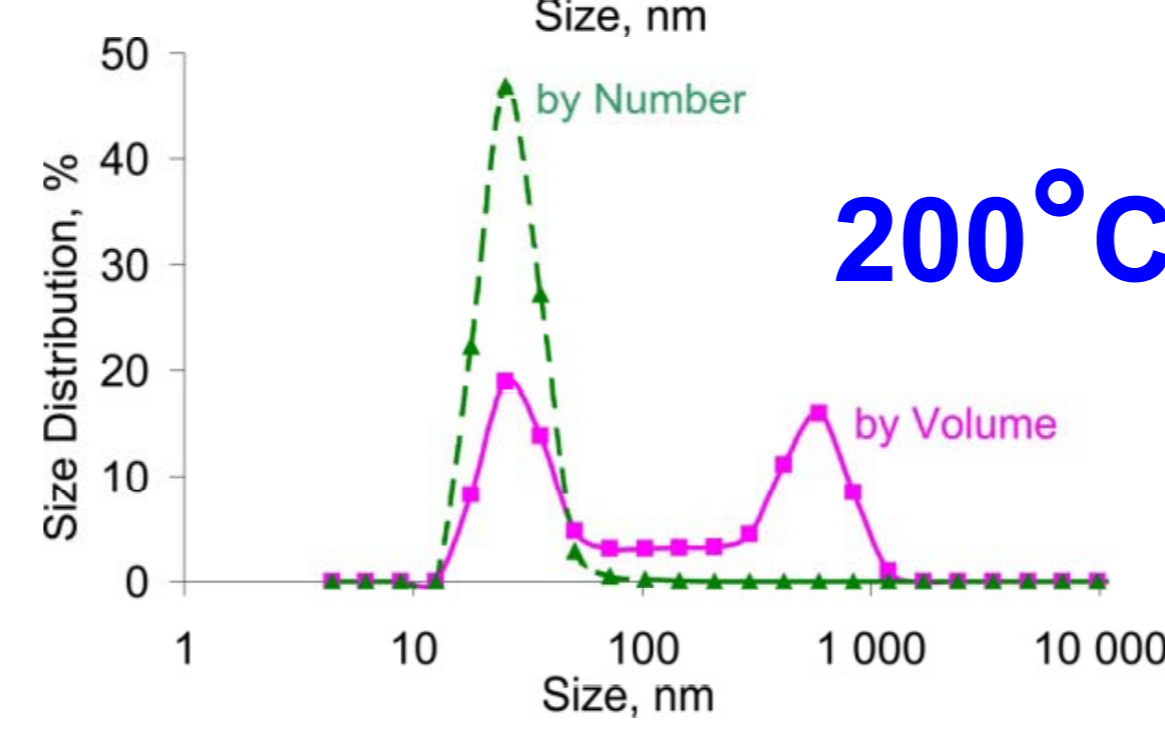
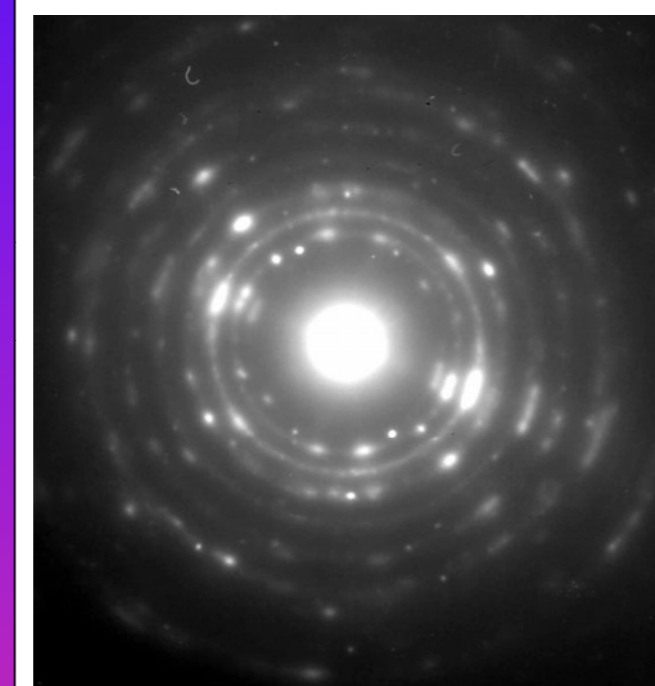
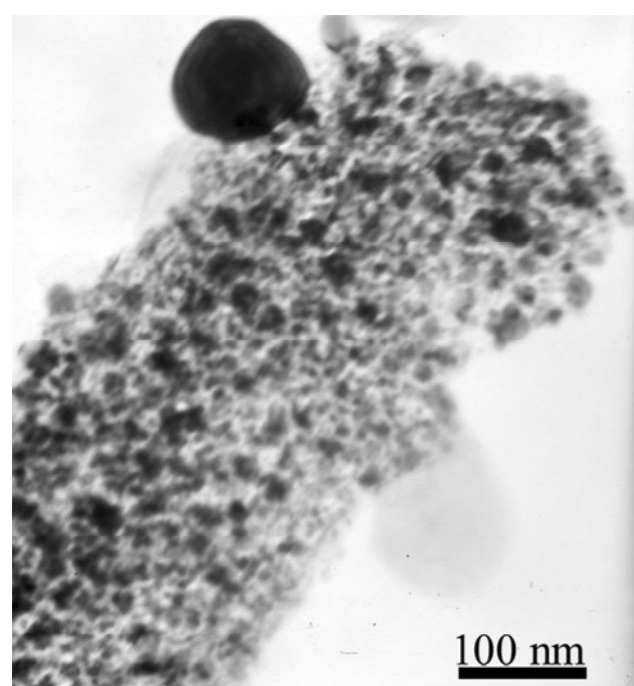
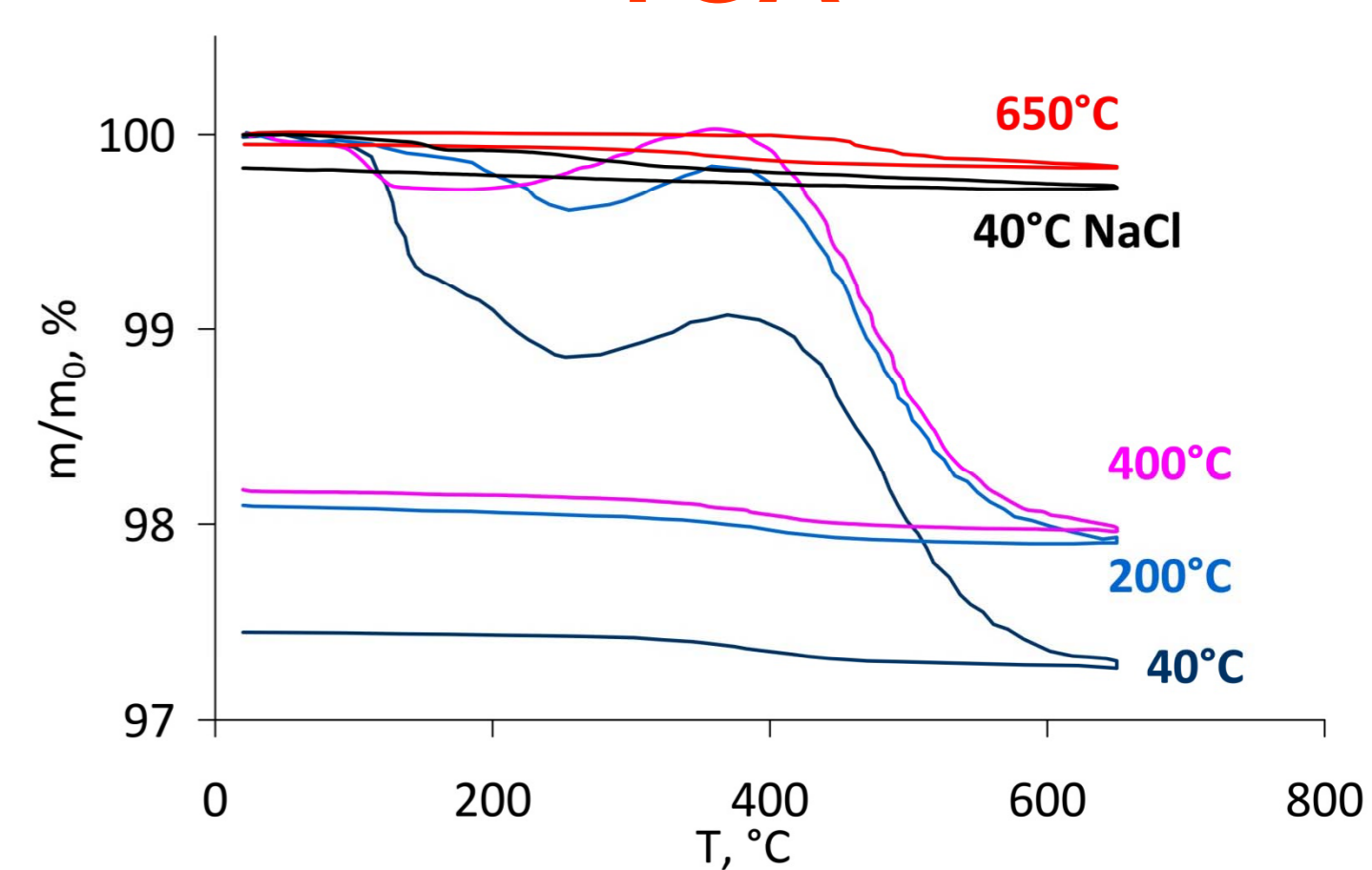
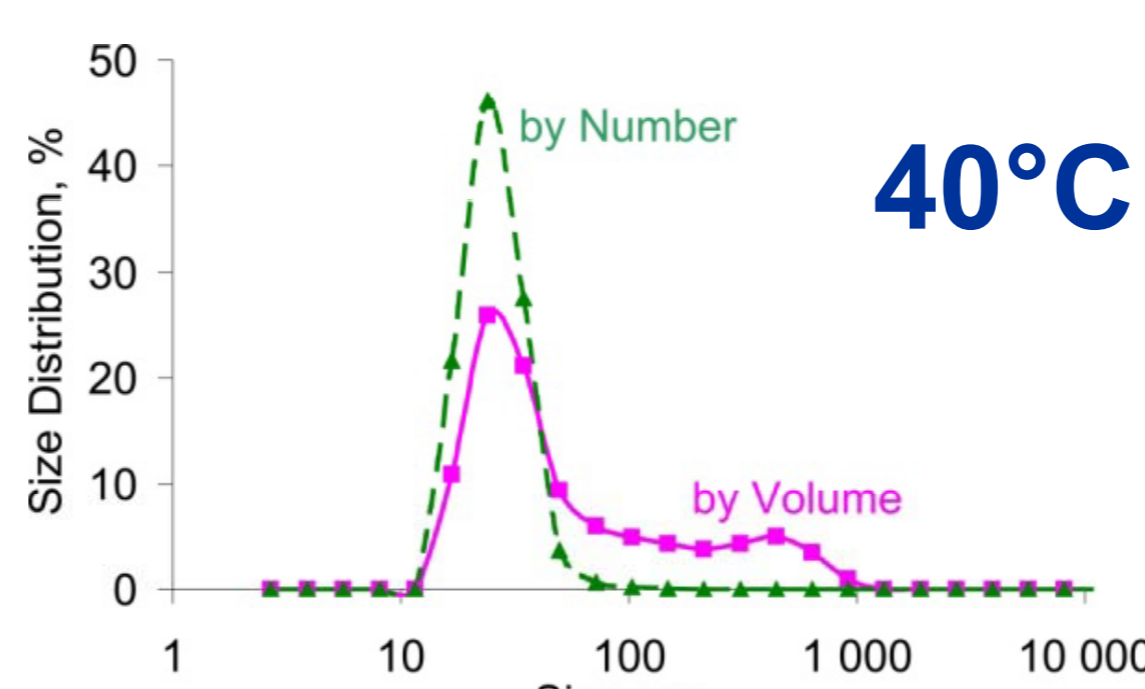
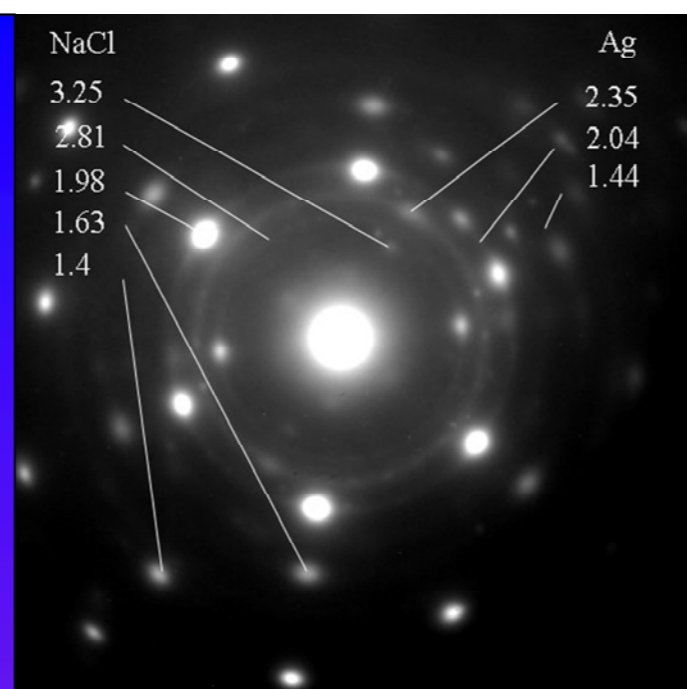
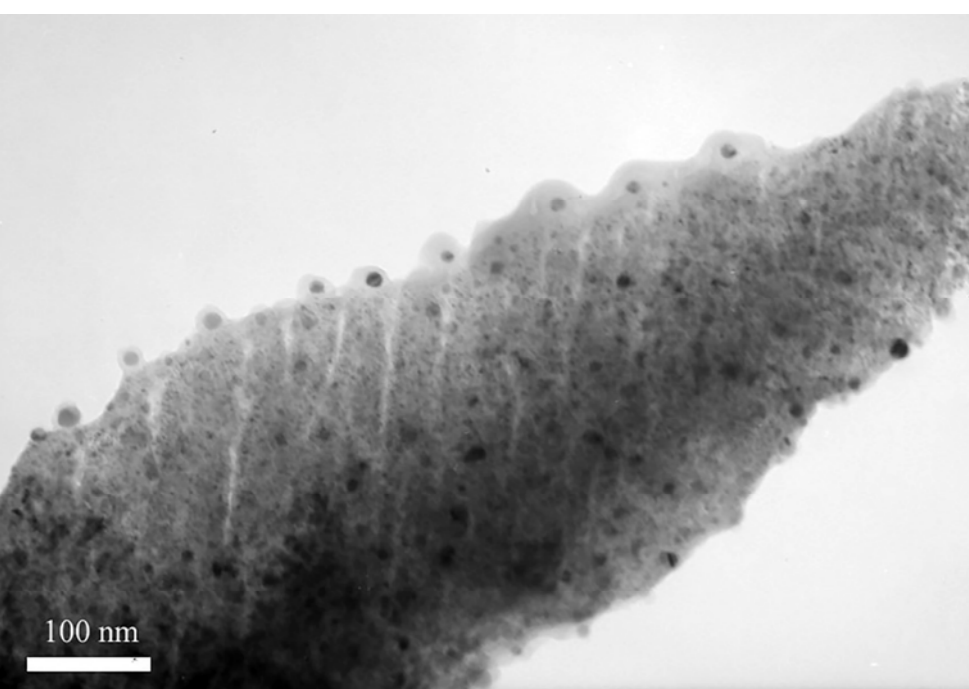
Low thermodynamic stability of silver compounds with oxygen did not allow directly identifying them by the methods of TEM and X-Ray Diffraction, although the method of thermogravimetric analysis registered the transformation processes in Ag-O system. Probably, silver NPs have on their surface a very thin film of silver oxide in the form of an Ag₂O phase [1], then it decomposes at a temperature of 430°C.

TEM

EDP

DLS

TGA



It was found that the minimum inhibitory concentration of silver nanosolution, which researched the growth of the studied *S.aureus* strains was 10 mg/l. Preparations with silver nanoparticles, both the initial sample and the samples obtained at different annealing temperatures (200°C, 400°C, 650°C) at concentrations of 10.0 and 20.0 mg/l, have a bactericidal effect on *S.aureus* strains after 24 hours of exposure. However, at concentration of 5 mg/l, bacteriostatic effect on staphylococci of these high temperature preparations is observed with the exception of the original.

1. Roy R., Hoover M. R., Bhalla A. S., Slawicki T., Dey S., Cao W., Li J., Bhaskar S. Ultradilute Ag-aquasols with extraordinary bactericidal properties: role of the system Ag-O-H₂O // Mat. Res. Innovations.- 2007.- 11, N1.-P. 3-18.

Contacts: Yurii Kurapov, +380442006855, e-mail: kurapov@paton-icebt.kiev.ua

