Interest in the synthesis of metal nanoparticles by explosion

- Ten and silver stearate **3-20 nm**

- Silver Azide **80 nm**

- Ferrocene and picric acid **5-20 nm**

- Hexogen and iron nitrate **18-55 nm**

- Ten and cobalt nitrate **15-25 nm**

- Ten and nickel nitrate **10-20 nm**

Factors Affecting Particle Sizes

- Explosive

- Type of metal

- Metal concentration

- Carbon supplements

Formulation of the problem

- The composition of explosives and metal (palladium) are fixed; there are no additional carbon additives

- Determination of the empirical dependence of particle sizes on the type of chemical compound palladium

Used compounds and explosives

- 4 palladium compounds (3% wt.) **1) Palladium nitrate Pd $(NO_3)_2$**

  2) Palladium Acetate Pd$(CO_3 COO)_2$

  3) Caprylate Palladium Pd $(C_7 H_{15} COO)_2$

  4) Palladium stearate Pd $(C_{17} H_{35} COO)_2$

- **Explosive composition - TATB / HMX 50/50**

Preparing and conducting an experiment

- Mixing a solution of a metal precursor with TATB powder

- Evaporation

- Octogen Blending

- The placement of a charge in an ice shell in a previously cleaned blast chamber

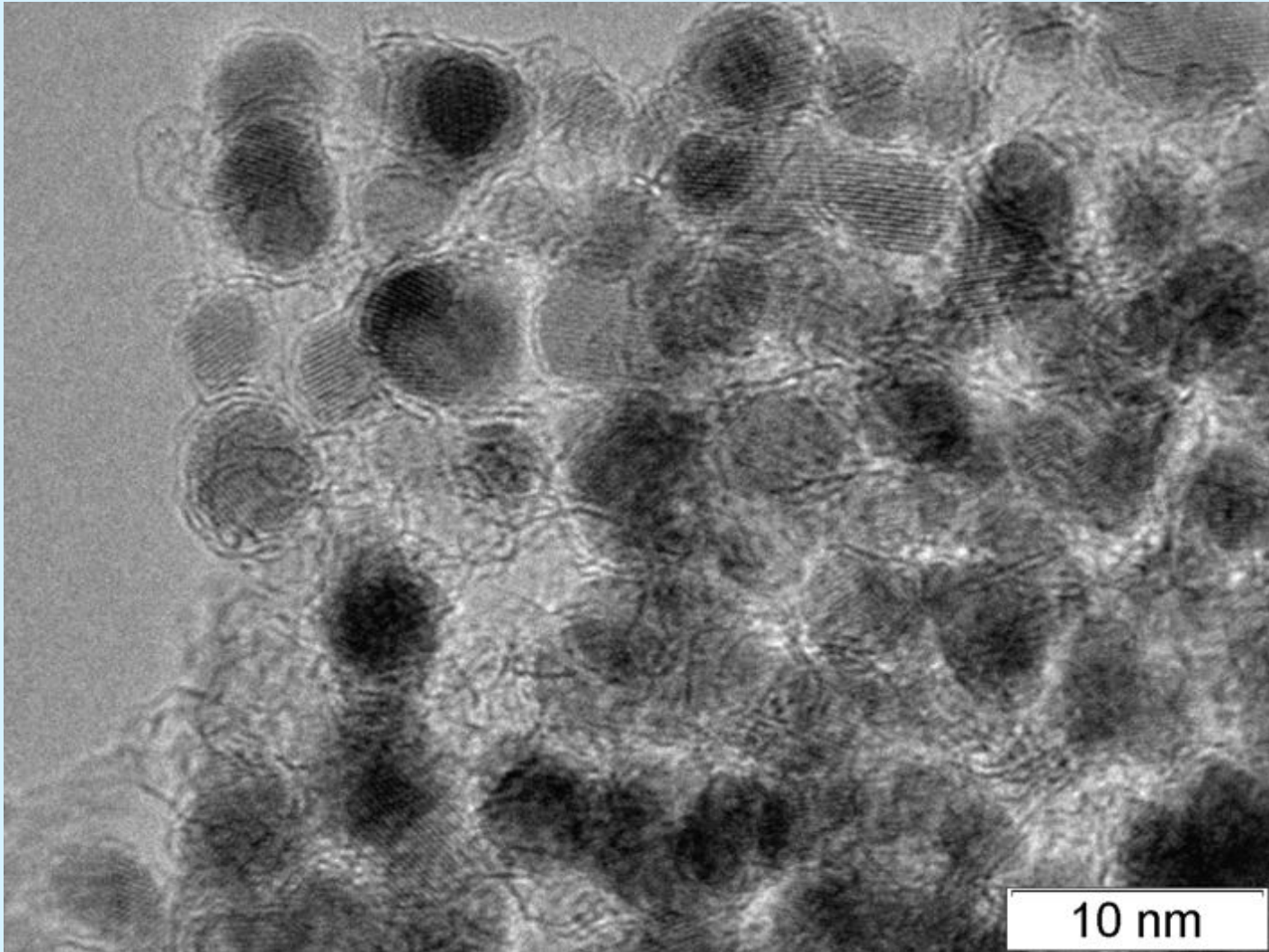- Explosion collection for further research
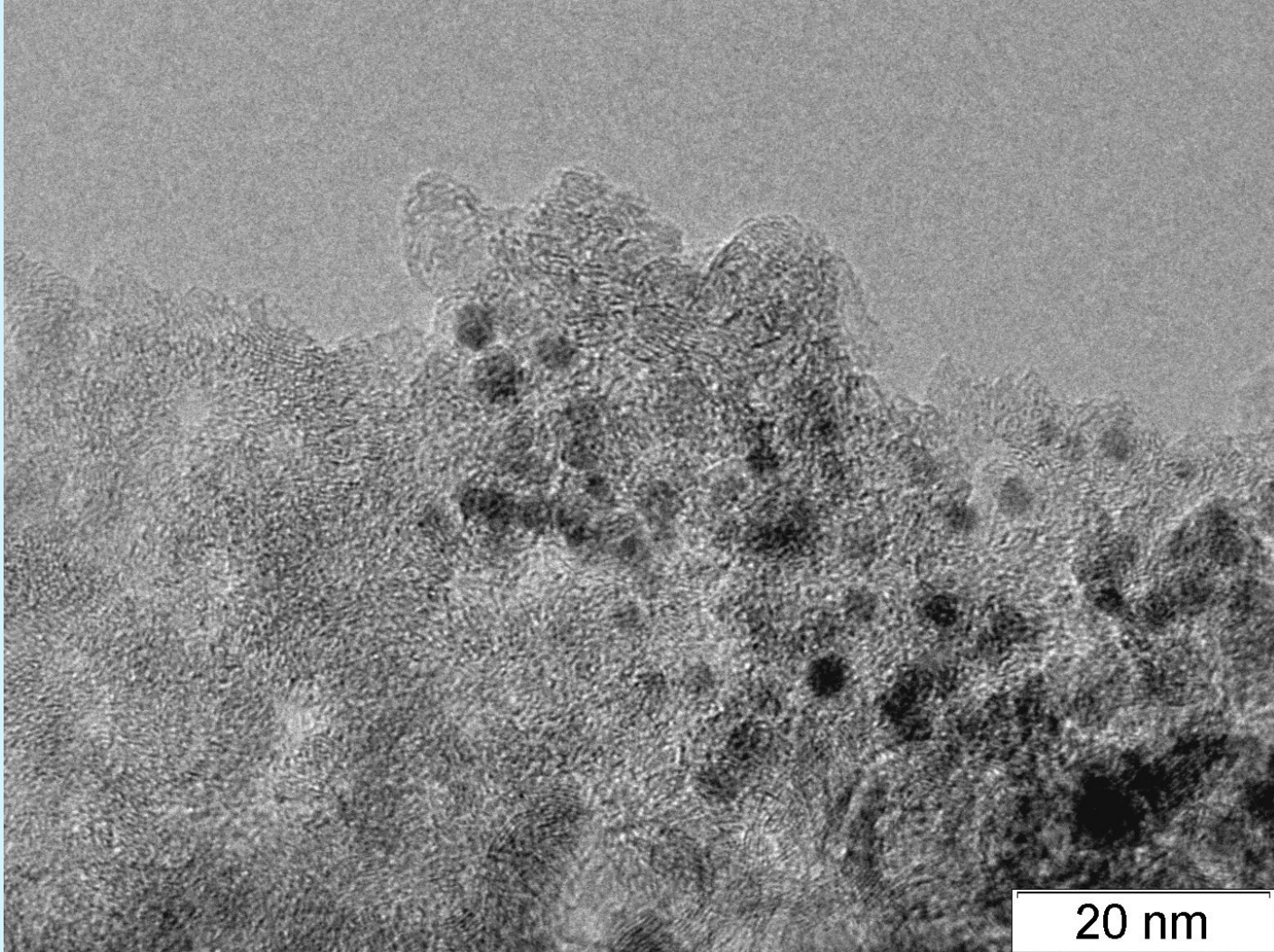
Preparing and conducting an experiment
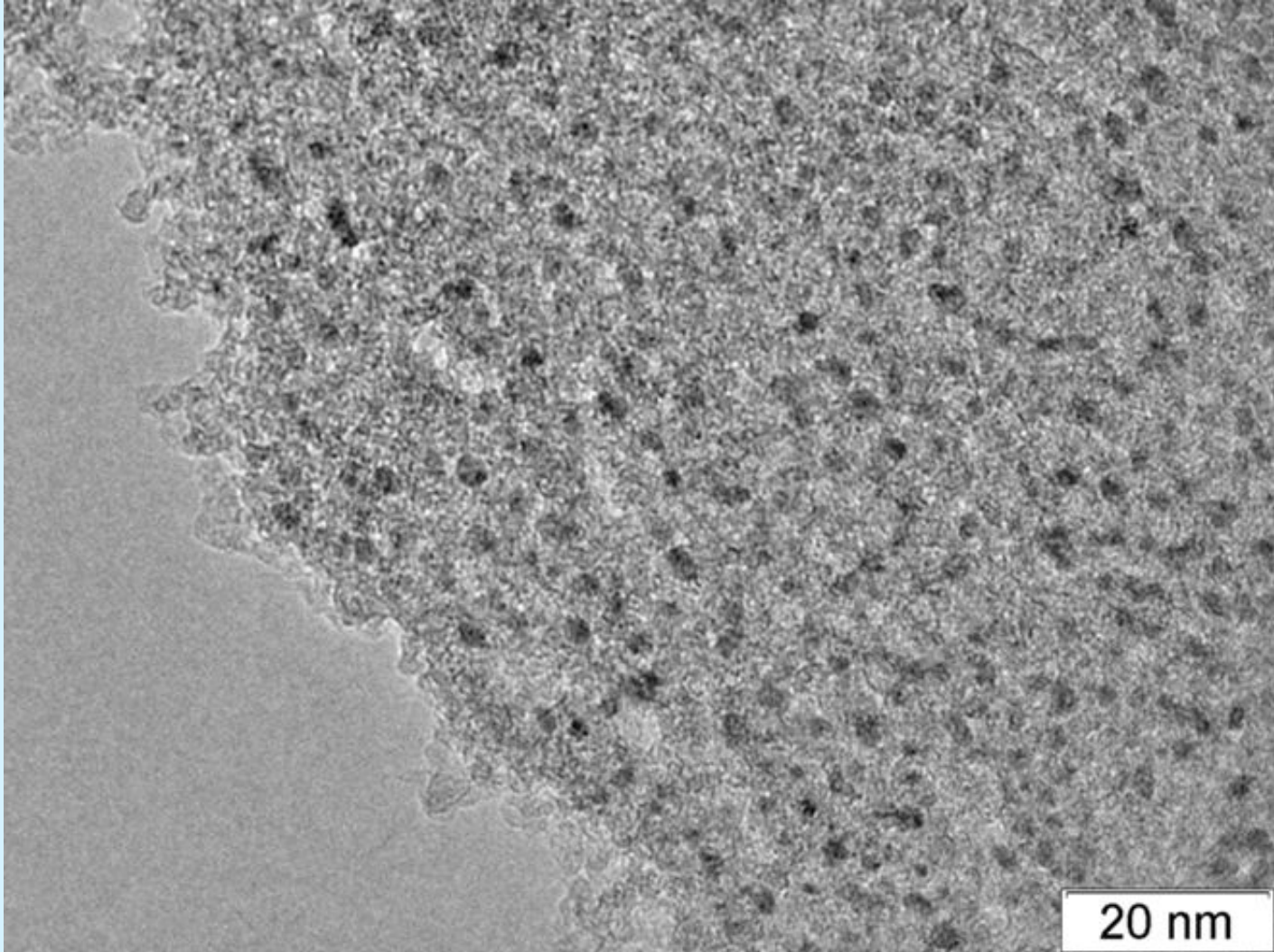
Palladium nitrate

50 nm

Palladium Acetate

10 nm
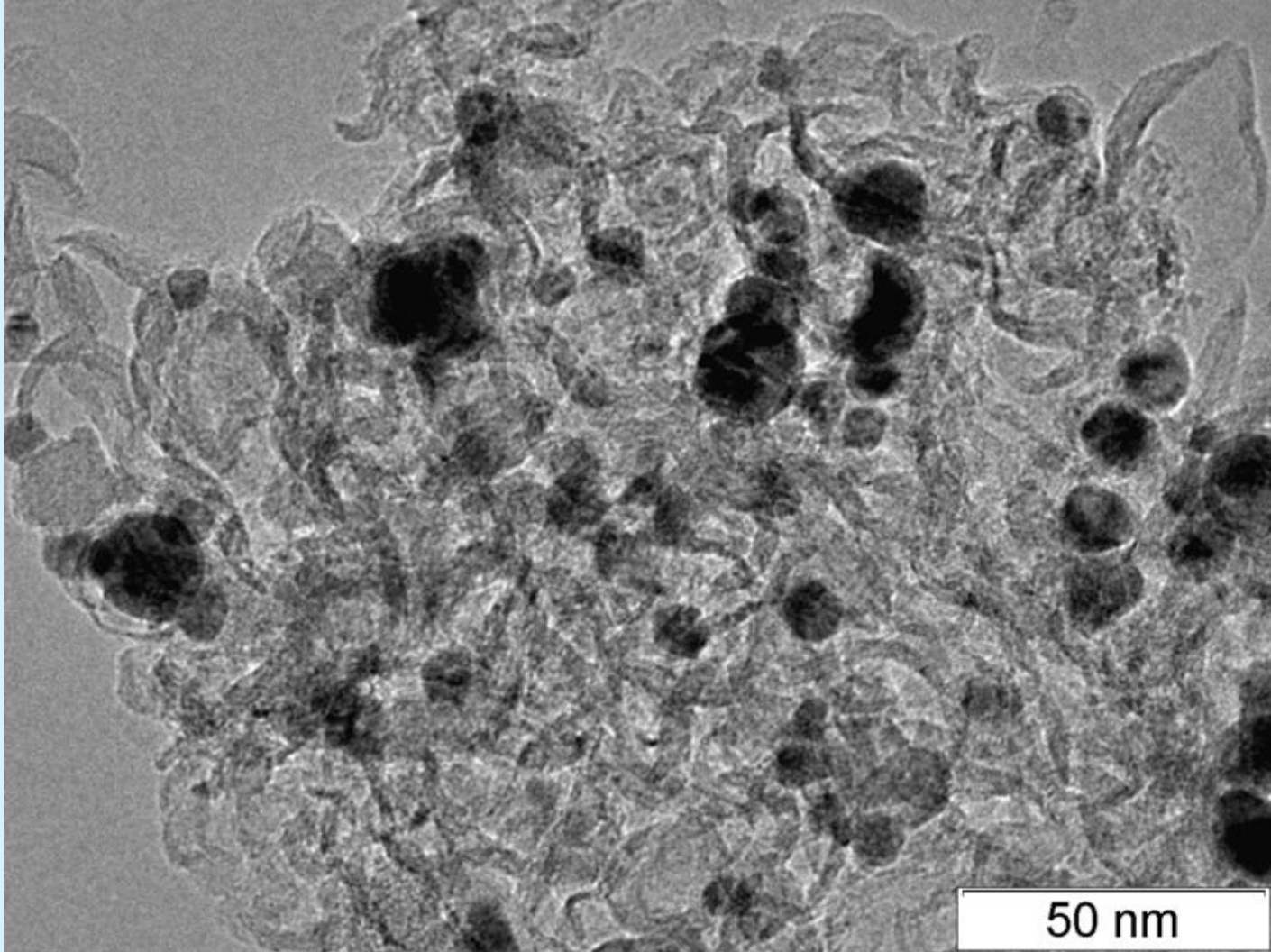
Caprilat Palladium

Palladium stearate

20 nm

The average linear and average mass particle sizes
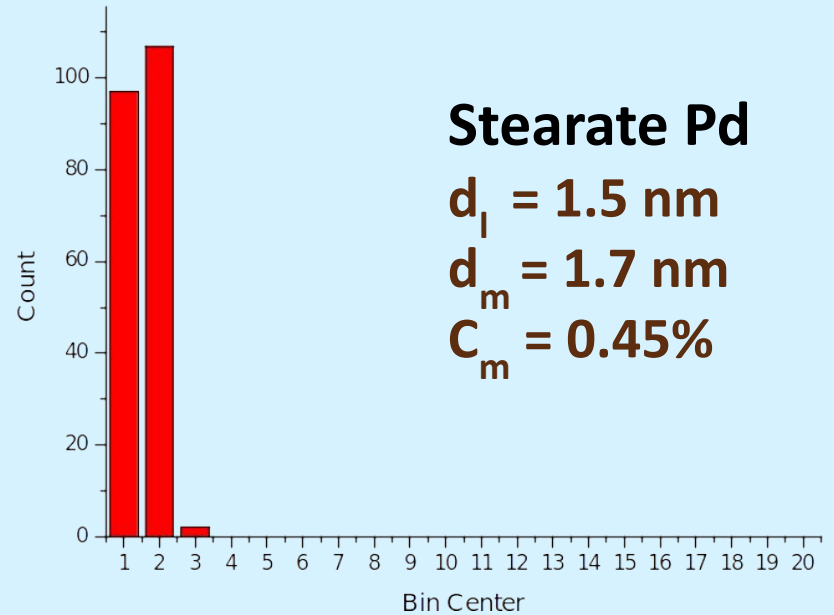
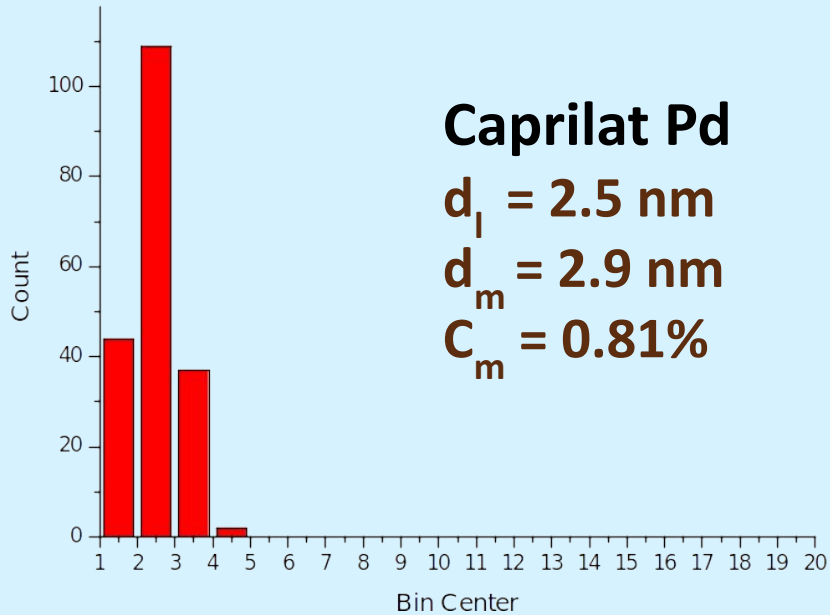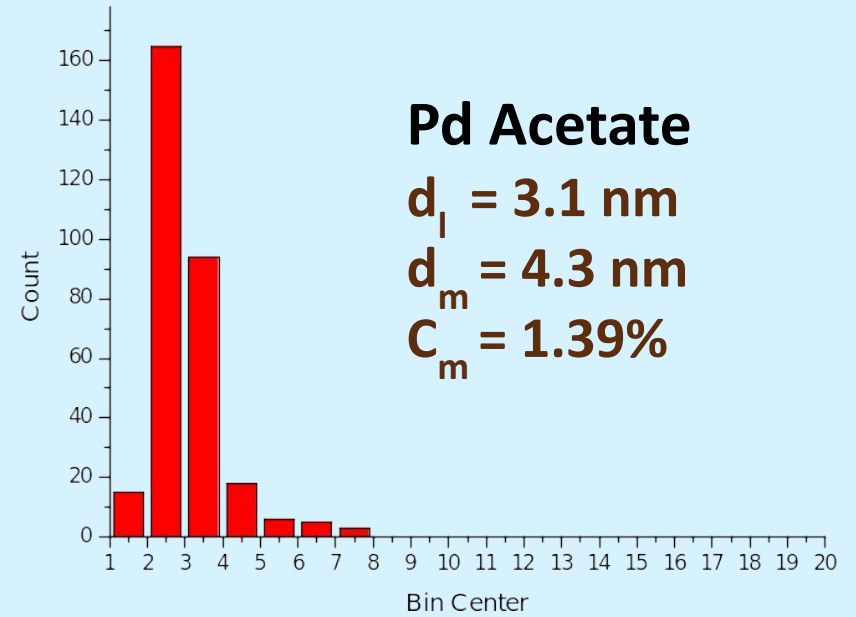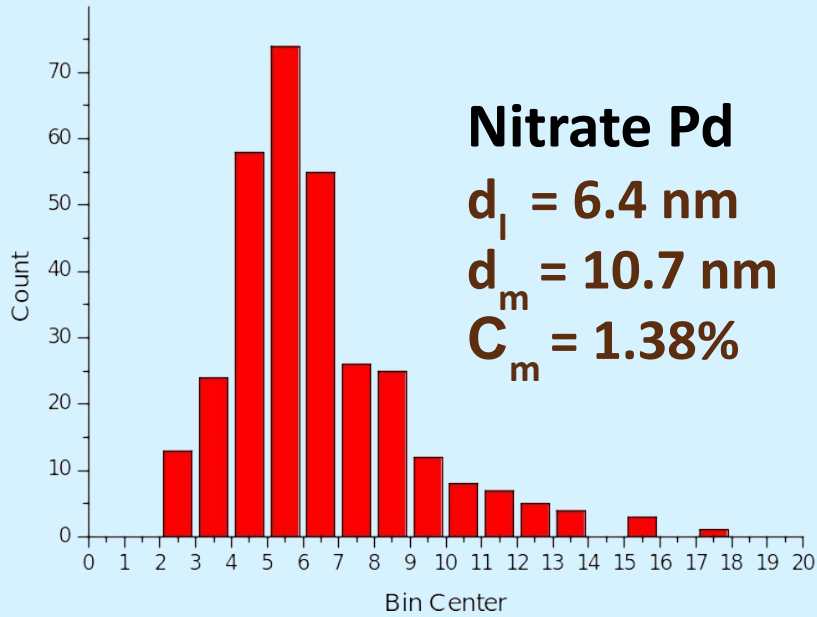- The average linear particle size

$$dl = \sum d_i / N,$$

N is the **number of particles**

- The average mass particle size

$$dm = \sum d_i^4 / \sum d_i^3$$

Particle size distribution

Nitrate Pd
d_l = 6.4 nm
d_m = 10.7 nm
C_m = 1.38%

Pd Acetate
d_l = 3.1 nm
d_m = 4.3 nm
C_m = 1.39%

Caprilat Pd
d_l = 2.5 nm
d_m = 2.9 nm
C_m = 0.81%

Stearate Pd
d_l = 1.5 nm
d_m = 1.7 nm
C_m = 0.45%

Results and Conclusions

- Palladium nanoparticles obtained by detonation synthesis
- Particle size is determined by the chemical composition of the palladium precursor
- The average particle size, depending on the precursor, is 1.5-6.4 nm
- **The results are published in the Journal of Physics: Conference Series, Volume 1147.**
- **Detonation synthesis of non-agglomerated metallic nanoparticles deposited on carbon supports. AO Kashkarov, ER Pruuel, KA Ten, E Yu, Gerasimov, SI Kremenko, IA Rubtsov, GR Dashapilov, PA Pyrjaev and BL Moroz**