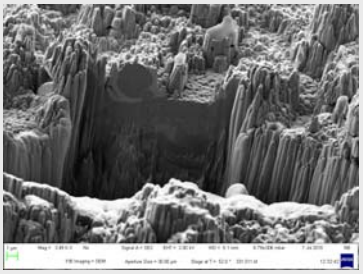
# Nanosized metallic oxides produced by Ultrasonic Spray Pyrolysis

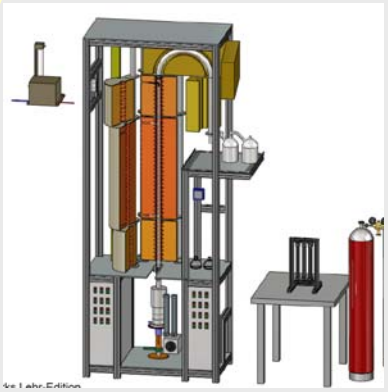
## Main aims

1. Synthesis of $TiO_2$ nanoparticles using an ultrasonic spray pyrolysis method
2. Examination of influence of the most critical process step (evaporation/precipitation) on particle morphology
3. Determine which parameters favour dense and spherical particle formation



**Obtained $TiO_2$ nanopowder is applied in gold layers of electrical contacts with a goal to increase the mechanical properties and life time of these coatings, without decreasing electrical conductivity.**

## Experimental method



Temperature (°C): 250-800-300 and 800-800-300

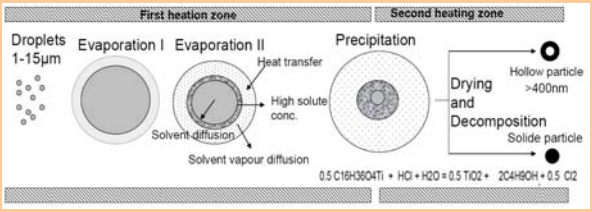
Ultrasonic frequency (MHz): 3*2.5

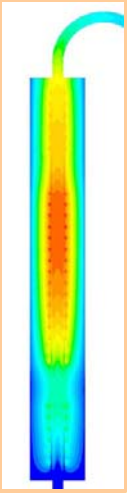
Atmosphere: $N_2$

Flow rate (l/min): 4-10

$C_{16}H_{36}O_4Ti$ concentration: 6g/l

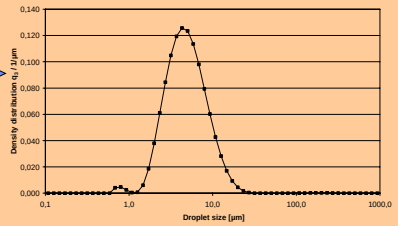
## Mechanism of USP- synthesis



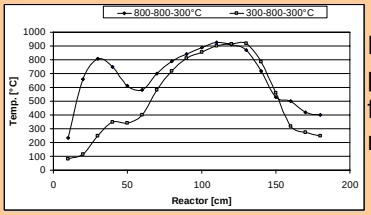



Main steps: evaporation of solvent, diffusion of solutes, precipitation, decomposition and densification.
Process temperature, droplet size and evaporation rate are the main parameters that influence particle morphology

## Main parameters that influence particle morphology:



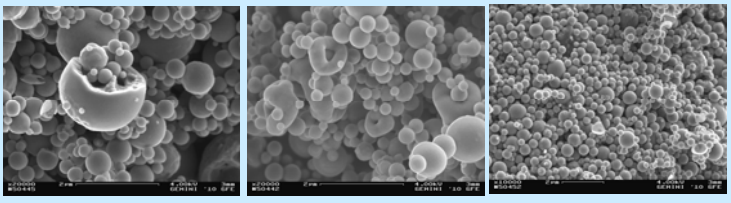

Droplet size distribution, measured with laser diffraction system (Malvern Spraytec)

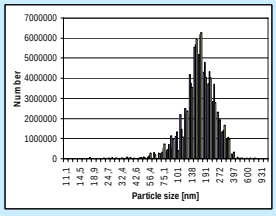


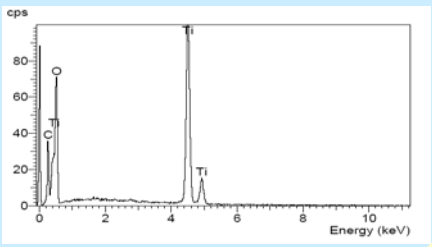

Measured temperature profile in reactor for different flow rates and temperature regulation in heating zones

## Results

Different morphology of $TiO_2$ nanoparticles were obtained and optimal condition for formation of dense particle is suggested






## Conclusion

- It is possible to produce nanosized $TiO_2$ with USP
- High evaporation rate lead to destroyed, non spherical particle
- To avoid formation of non spherical particles it is recommended to have reactor with slowly increasing temperature profile

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