



# Moscow Region State «University of Technology»

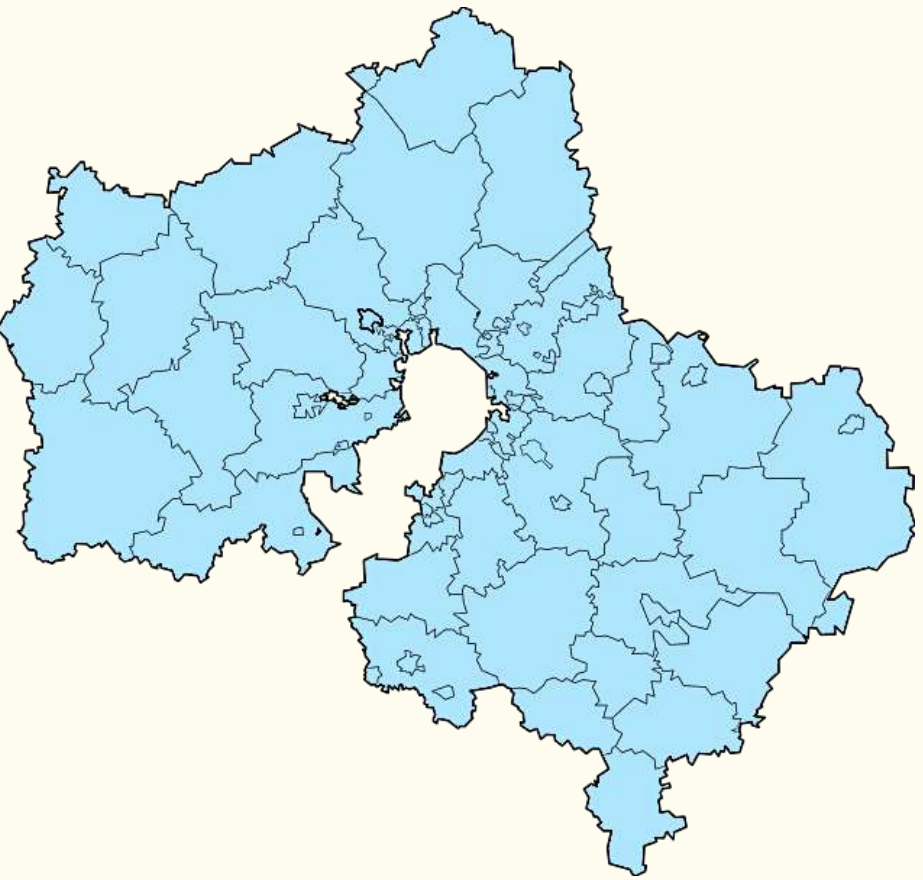


*development priorities for  
international scientific and  
educational cooperation*

# Location

«The University of Technology» («MGOTU») is located in Korolyov.

- Korolyov is an industrial and science city in Moscow region, Russia, well known as the cradle of Russian space exploration. Population: 200 000
- Mission Control Center is located in Korolyov, as well as most of the leading enterprises of the space industry
- Korolyov hosts the International Space Olympics, an annual competition for young people, to promote space related research.



Moscow Region

# Facts & Figures

## EDUCATION

**7200 STUDENTS**

- 1200 «Kvantorium» students (highschool)
- 500 foreign students
- 60 specialities
- 26 engeneering specialities

## STAFF

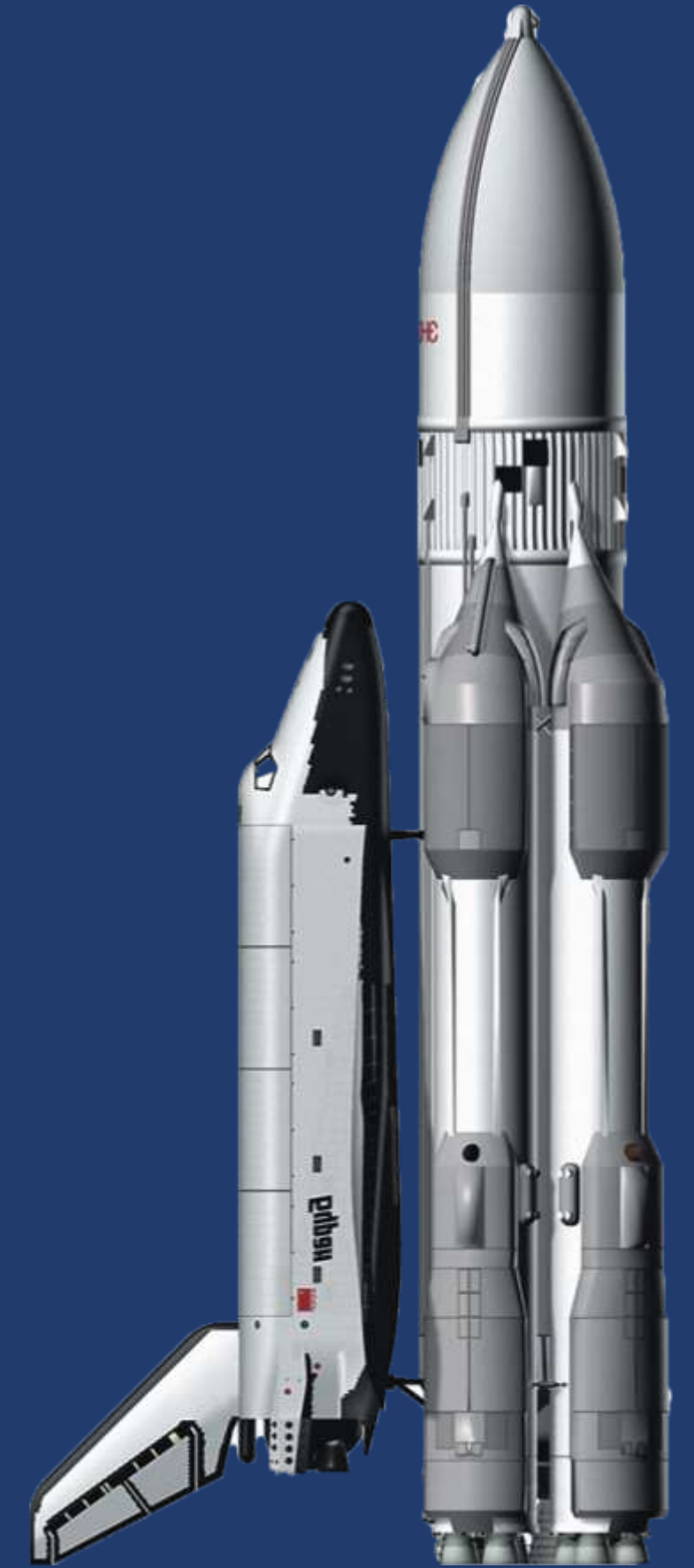
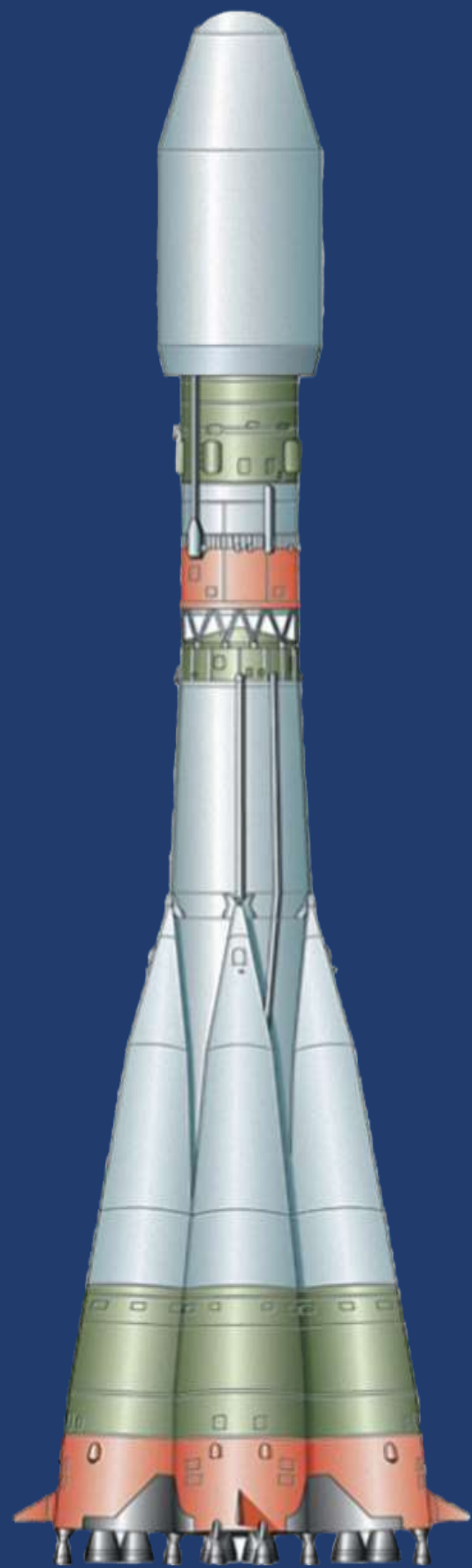
**620 EMPLOYES**

- 283 Professors
- 500 foreign students
- 57 industry lecturers
- 20 researchers

## SCIENCE

**6650 ARTICLES in russian**

- 40 articles in english
- WoS/Scopus per year**
- 120 postgraduates
  - 3 journals
  - 30 laboratories (4 scientific)



# University Technopark Education System



**1200**  
High school students  
/ per year



**12**  
enterprises  
departments

- ideas
- projects
- creativity in tech
- career guidance

- fundamental engineering education

- enterprise scientific guidance

- R&D commissioned by enterprises (industrial partners)



# Composites Technopark



**3**  
laboratories



**2**  
CVD Plants

**3**  
Braiding  
machines

Research staff - **10**

**2**  
Termoplastic  
machine

[www.kompozit-ut.ru](http://www.kompozit-ut.ru)

High temperature Engineering Center

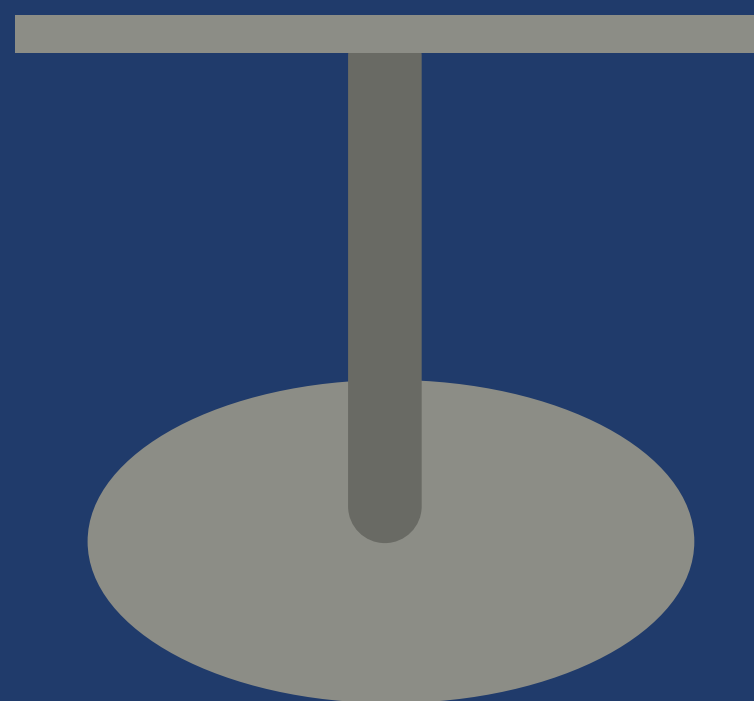
# Technopark Research CVD plants



Pyrolytic Boron Nitride Deposition Plant 1.0

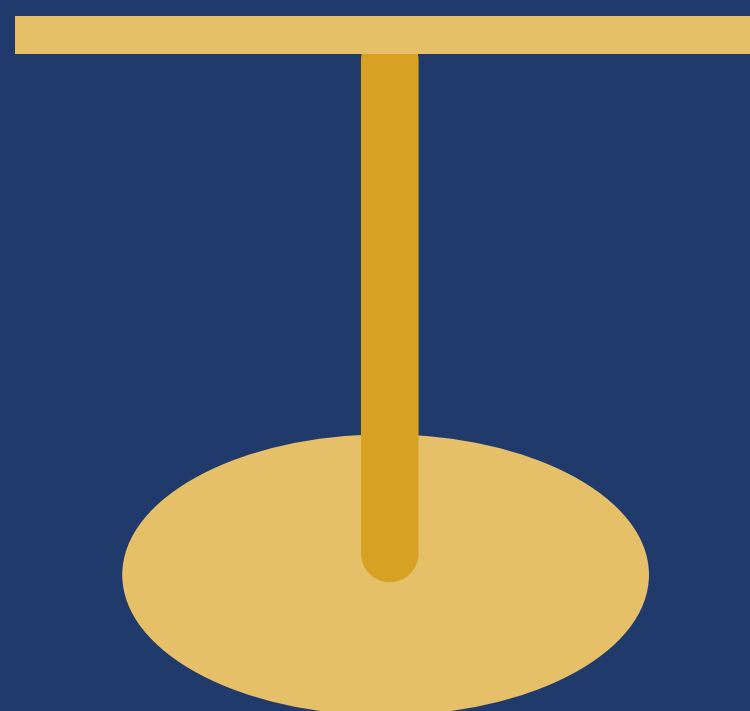
## 2015

BN 1.0 Plant  
- D 80mm / H 300mm



## 2018

BN 2.0 Plant  
- D100mm / H300mm  
SiC (MTS) Plant  
- D300mm / H500mm



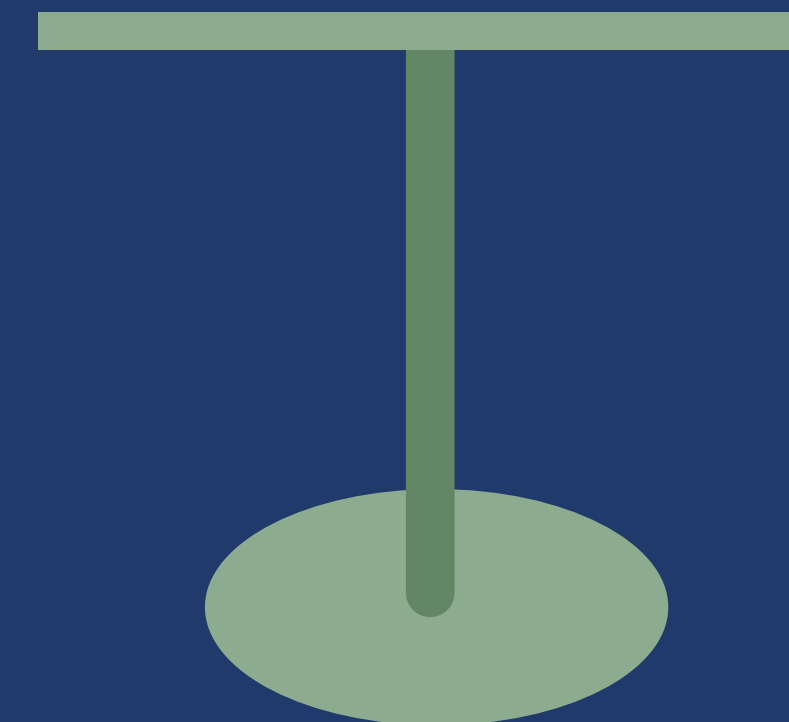
Pyrolytic Boron Nitride Deposition Plant 2.0



Silicon carbide Deposition Plant (MTS)

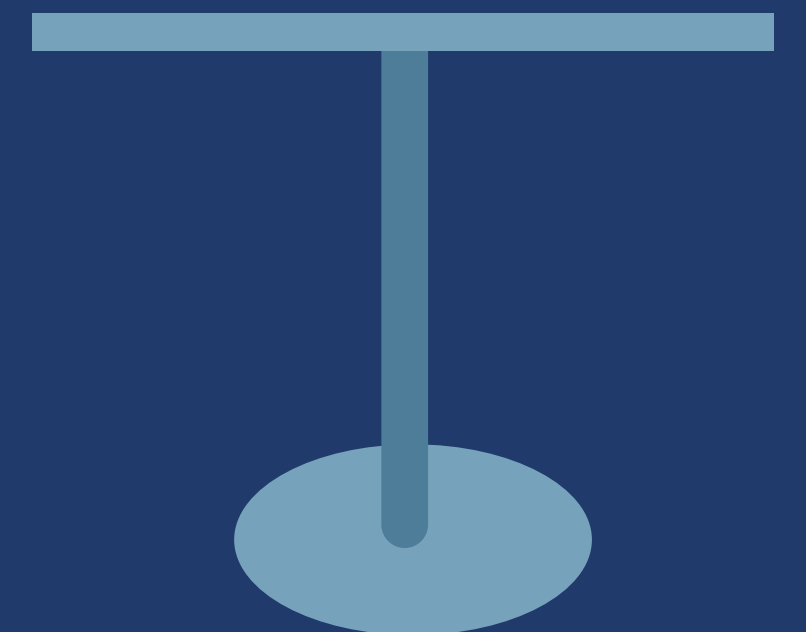
## 2019

BN 3.0 Plant  
-D400mm /H600mm  
HfC Plant  
- D80 mm / H350 mm

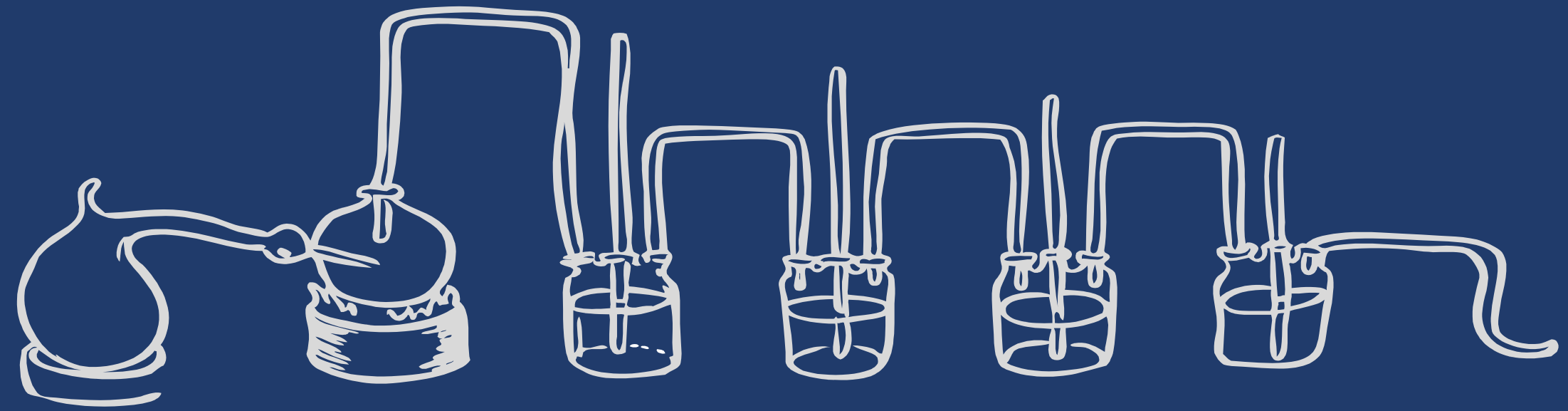
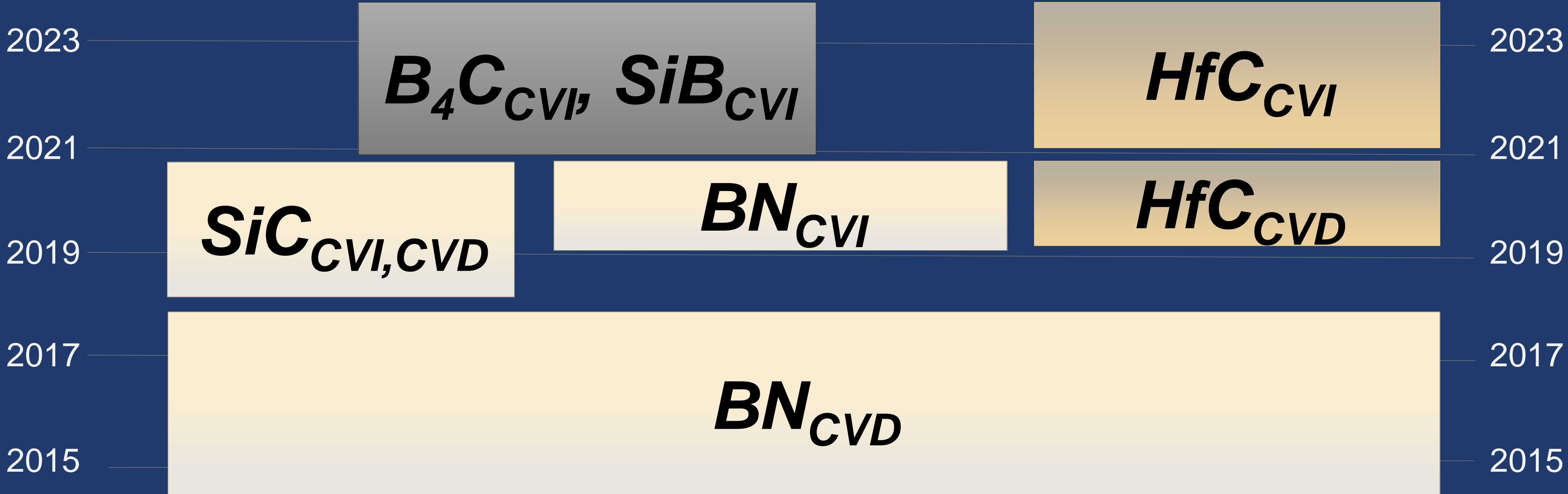


## 2021

ZrO<sub>2</sub> Plant  
SiO<sub>2</sub> Plant



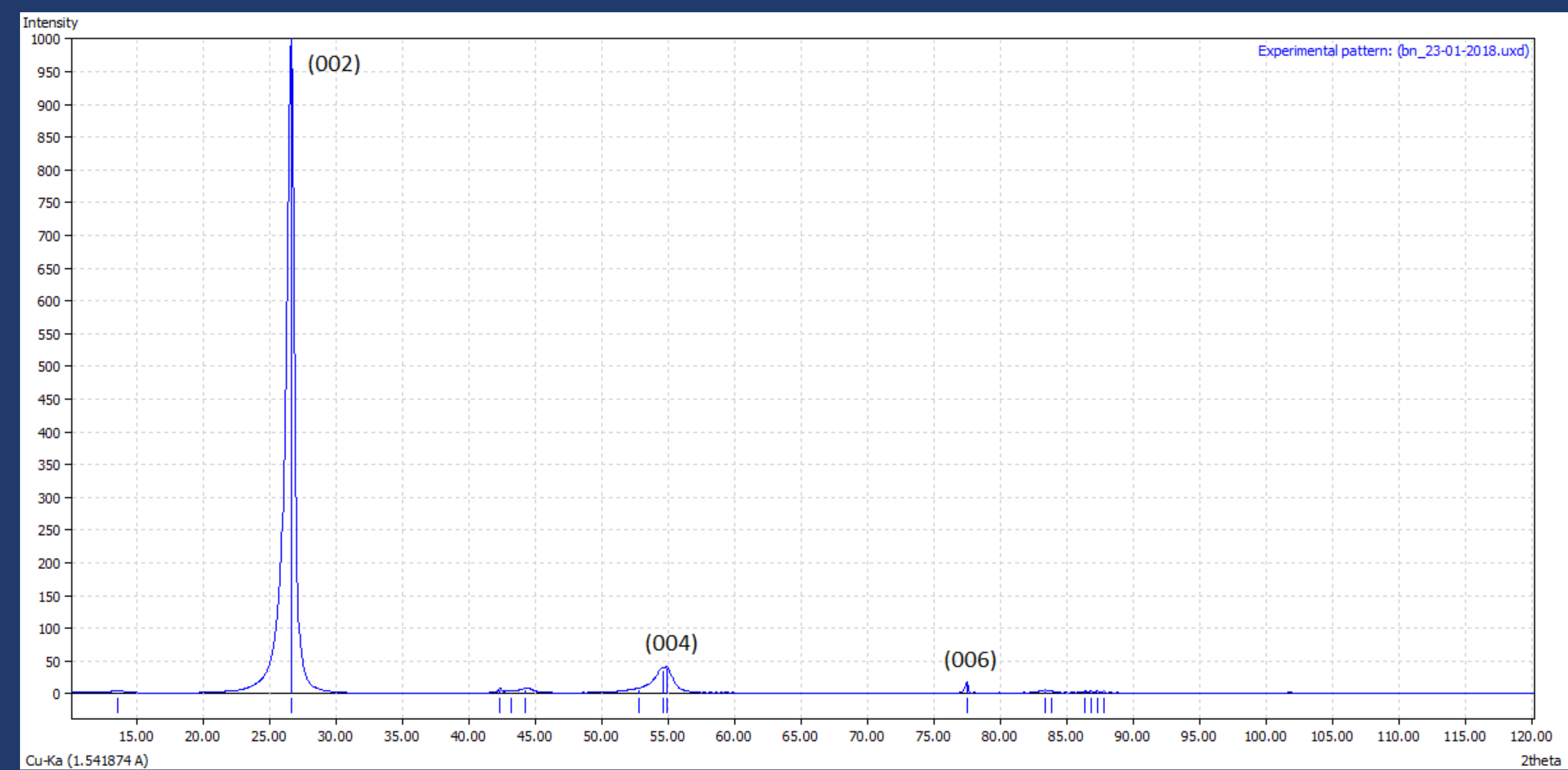
# Development of technologies of chemical deposition



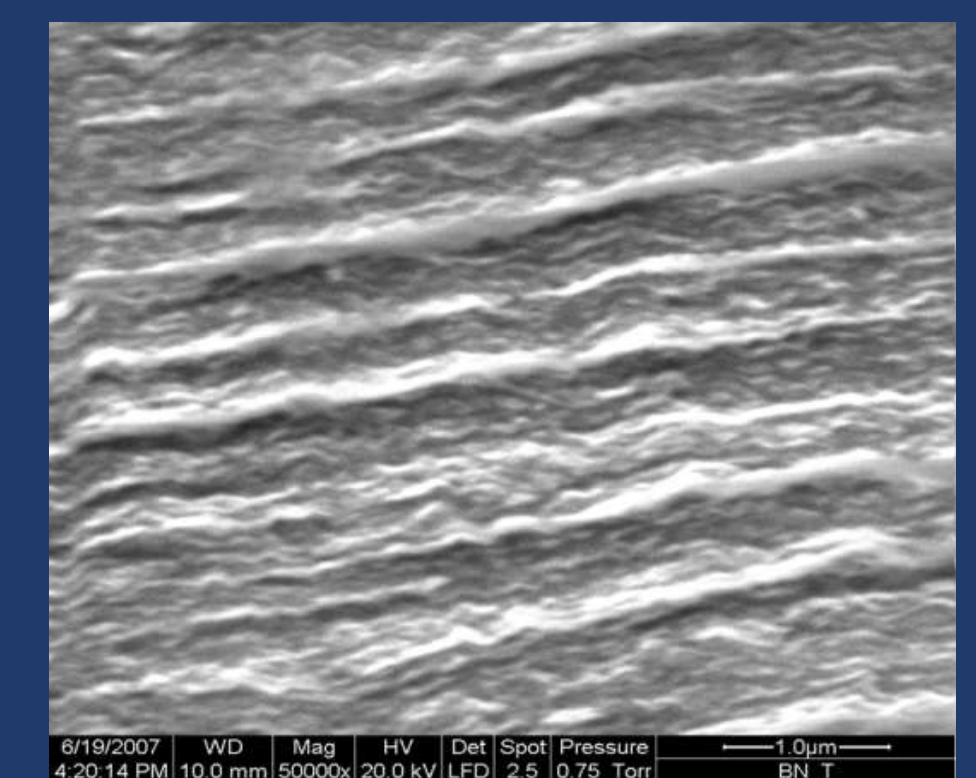
*BN B4C HfC SiC*

# CVD technology of producing pyrolytic BN

Option	Result
Crystal lattice	hexagonal
Density, g/cub.sm.	1,97-1,99
Fraction of impurities, % at.	0,01
refractive index (137GGZ)	2,126..2,152
tgδ [x10 <sup>-3</sup> ] (137 GGZ)	1,4..1,9



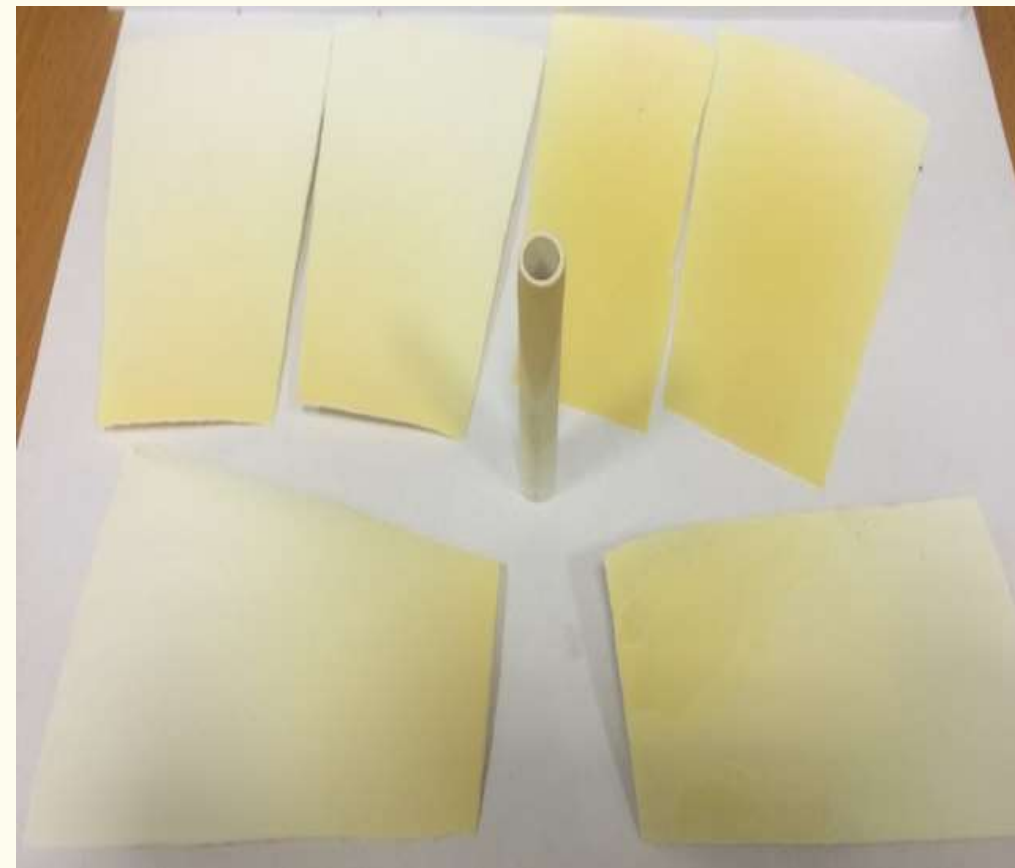
Sciagram



Microscopy



# Products CVD - BN



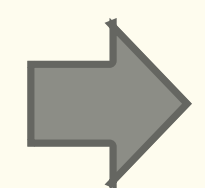
← Product samples (half-stuff) ↑

## End-products:



← Microwave Power Windows

Electrical insulation material for plasma engines of satellites and spacecraft



← Protective coatings for graphite evaporative melting pots

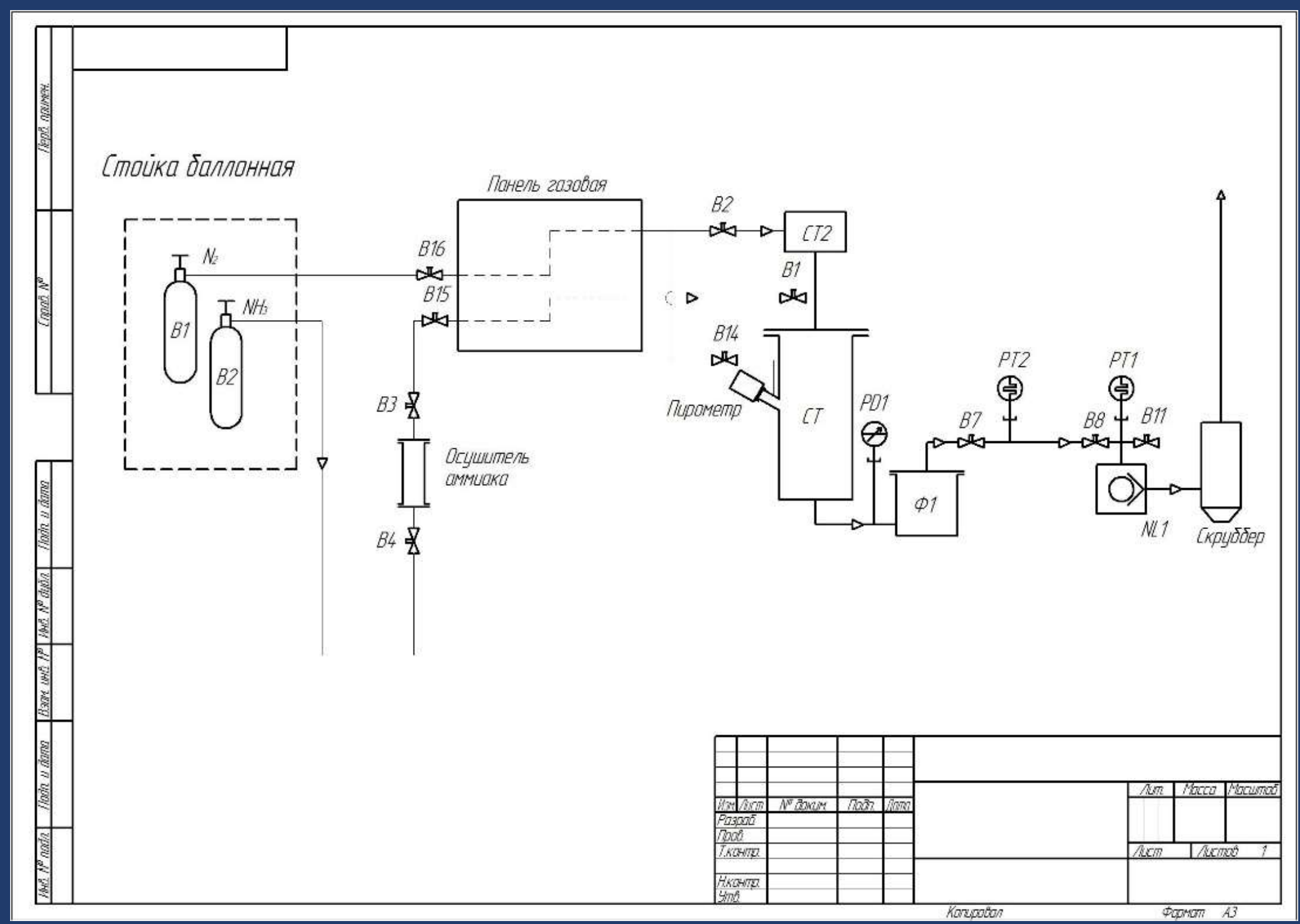
The flow reactor isothermal dimensions of the working area



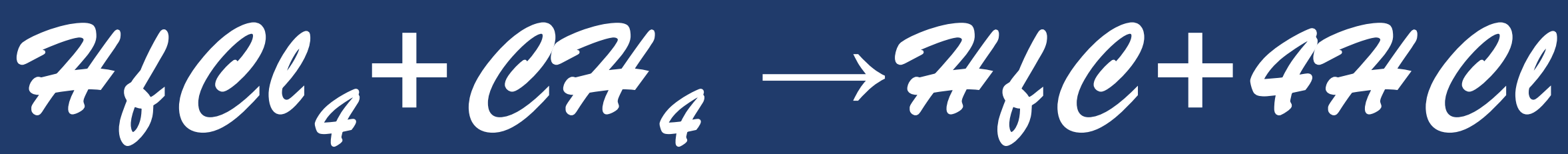
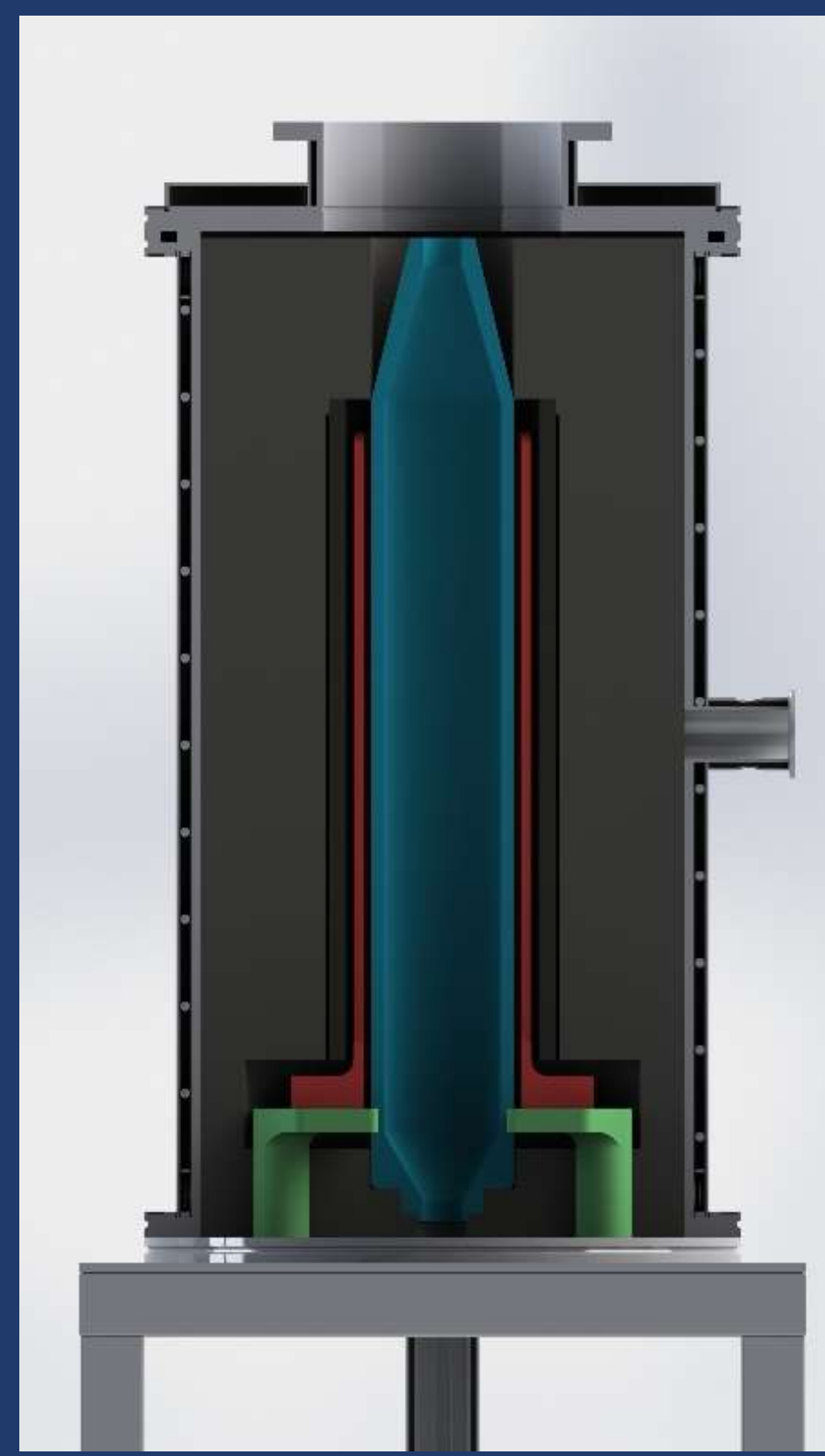
D100mm H300mm

***BN 3.0 – D400mm H600mm (2019)***

# CVD technology of producing pyrolytic HfC



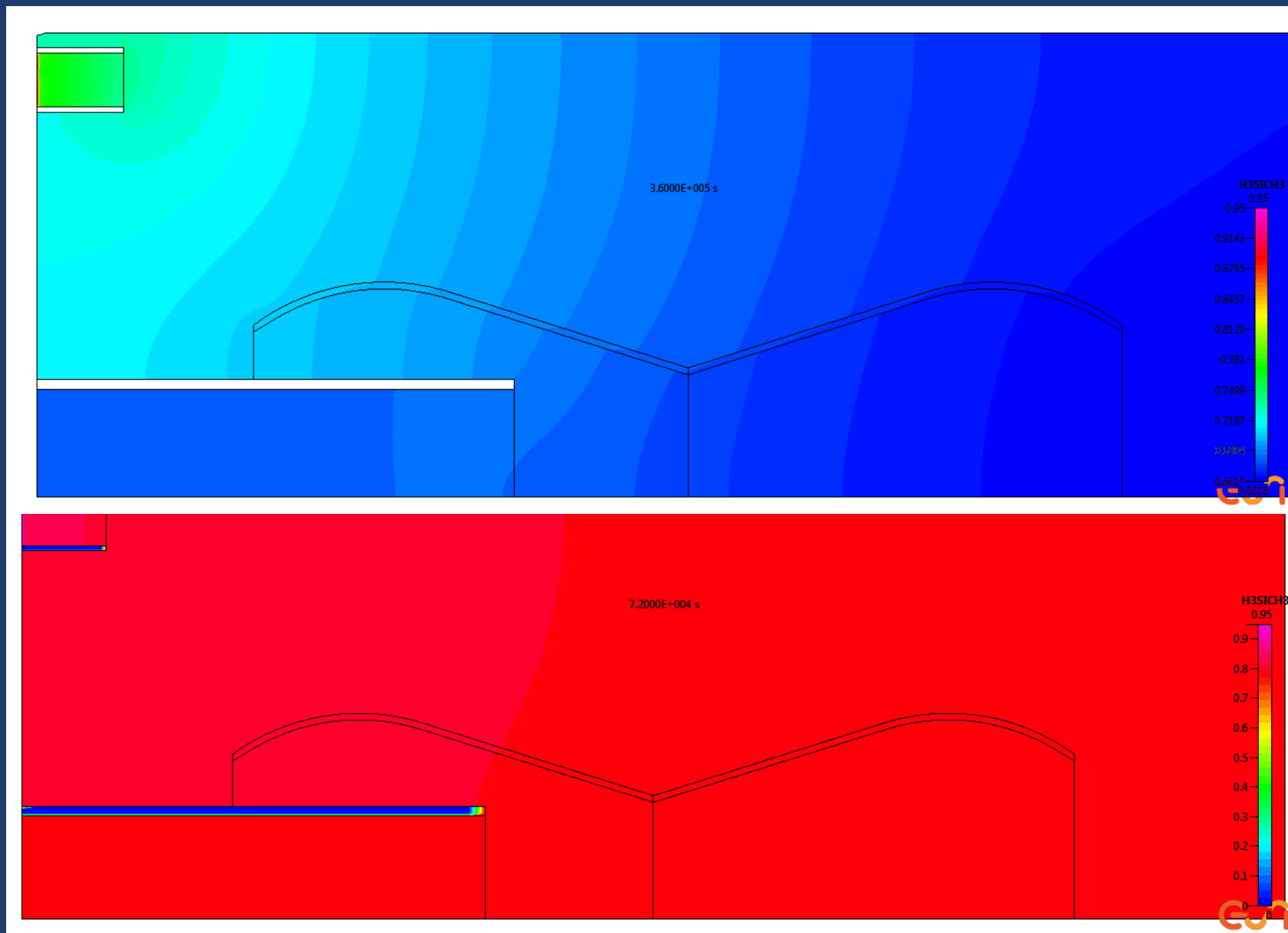
The size of the chemical reactor  
Continuous monitoring of the mass of HfCl<sub>4</sub> in the process of evaporation.



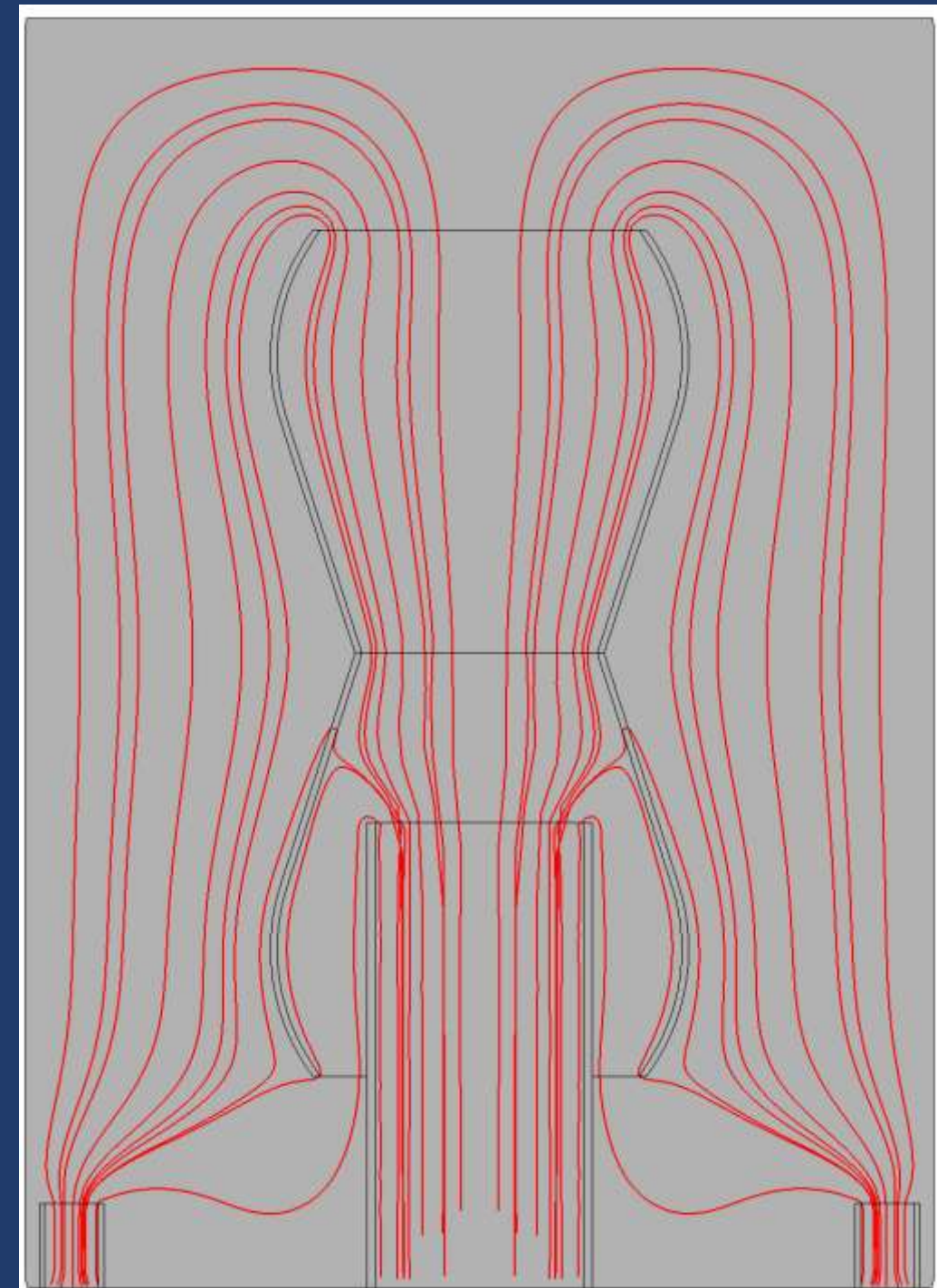
HfC – D80mm H350 mm (2019)

# Placement layouts and supply/disposal lines development for CVD

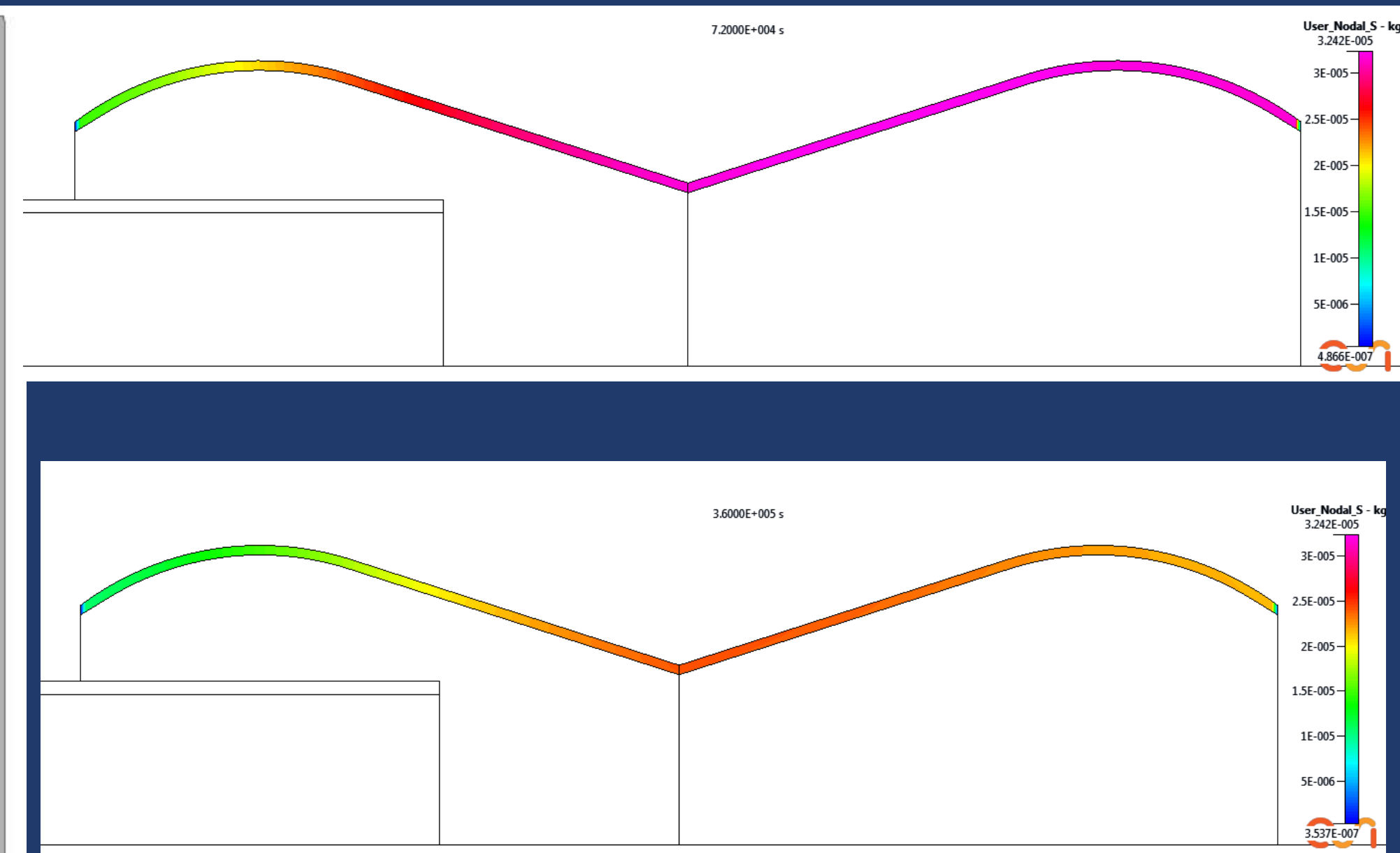
CFD-ACE+ with CVI module



Fields of concentration in the process of compaction of the porous body at the first and 300 hours of deposition

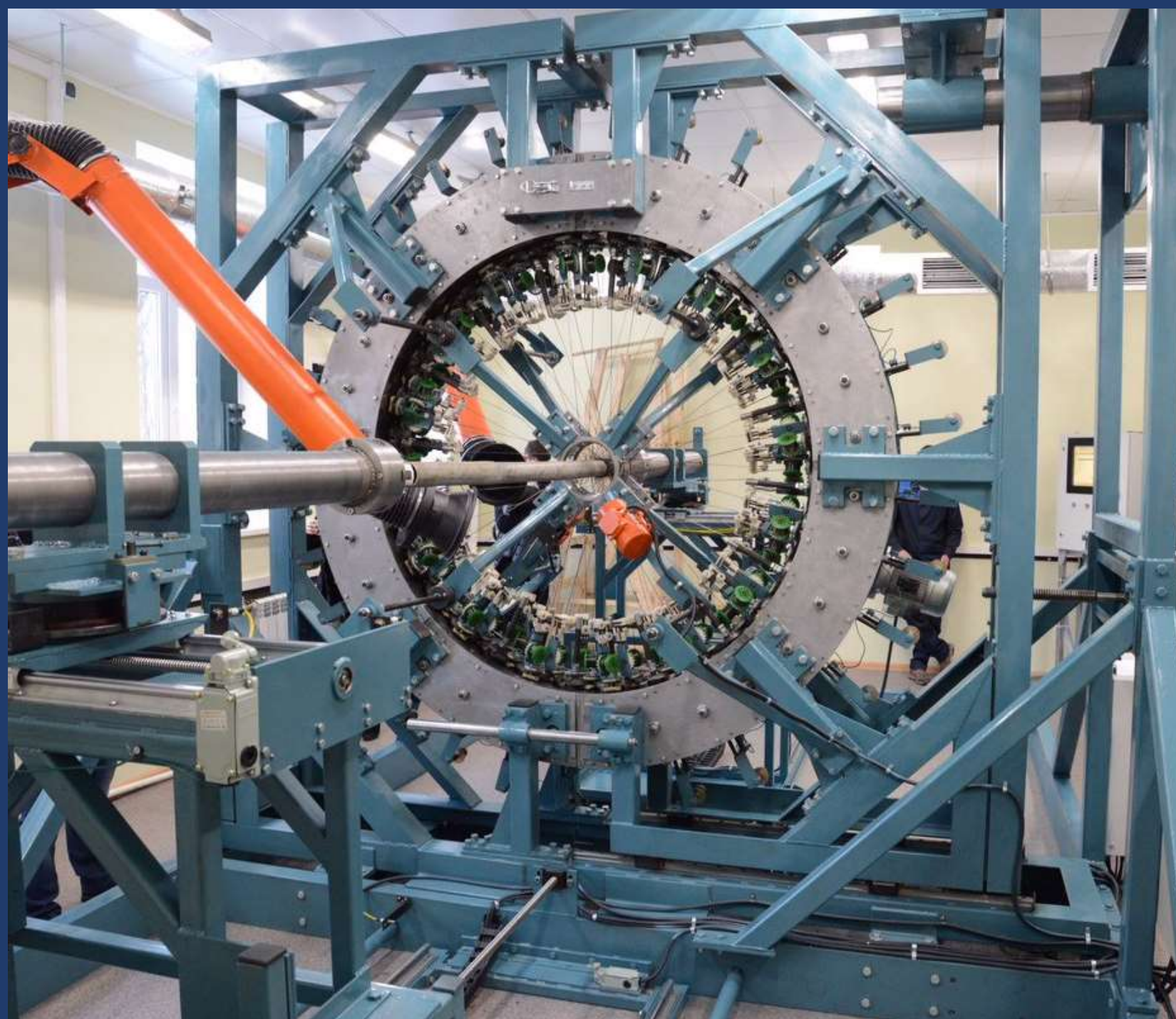


Flow lines



Change velocity of mass of the porous body in the first and 300 hours of deposition

# Technopark Braiding technologies



Russian made unique Brading plant RP-64

- Contour weaving by Russian carbon high-strength and high-modulus yarns .
- Contouring weaving on two and three axial (with skeletal reinforcement) schemes.
- Contouring weaving products with a straight and curved axis.
- Contouring weaving products with a closed axis .
- Application of an interlayer layer with a continuous surface hiding power up to 200 mm in diameter.
- Application of an interlayer layer to larger diameters with the formation of a network structure.
- Contour weaving of products of unlimited length.

# Cooperation with University of Technology

## In Research:

- Development of chemical deposition technologies
- Thermoplastic Polymers fittings (incl. PEEK) technologies
- Braiding technologies for manufacturing of curved lines and frames for composites

## In Education:

- Postgraduates exchange for joint research and results publishing (incl. joint research funding programs)
- Youth technopark net technology for accelerating students innovations
- Joint conferences (composites, space exploration, robotics, artificial intelligence, information security etc.)