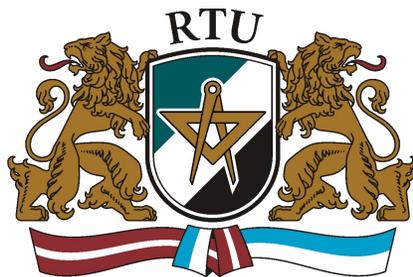
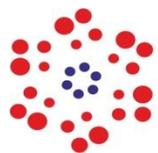


The possibility of modifying the elements of the metal powder assembly with nanoparticles in order to reduce the friction coefficient

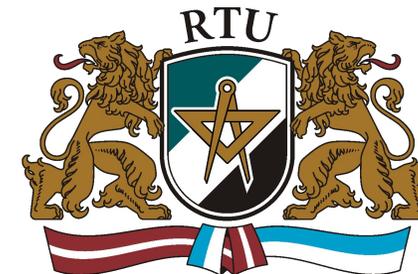
- Prof. Hab.Dr.Sc.Viktors Mironovs, Dr.Sc. Aleksey Tatarinov, Mg.Sc. Pavel Stankevich, Mg.Sc. Andrej Shishkin – Riga Technical University (Latvia)
- Prof.Dr.Sc. Oleg Tolochko, Dt.Sc. Ekaterina Vasilyeva, Mg.Sc. Alexander Breki – S.Peterburg Peter the Great State Polytechnic University (Russia)



Санкт-Петербургский
государственный
университет



**Scientific
Laboratory of
Powder Materials**



RTU Scientific Laboratory of Powder Materials



**Viktor Mironov
(Prof.hab.Dr.Sc.Ing.)**



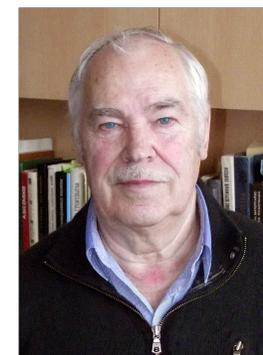
**Dr.Sc.Ing. Vyacheslav
Lapkovsky**



**Mg.Sc. Andrew
Shishkin**

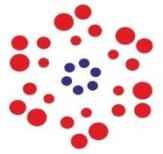


**Prof.Dr.Sc.Ing. Irina
Boyko**



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Polyakov**

Kipsalas srt. 6B-331, LV-1048, Riga, Latvia. Ph. (+371) 29146944,



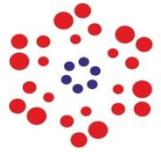
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Powder details on the Basis Fe-C-Cu materials

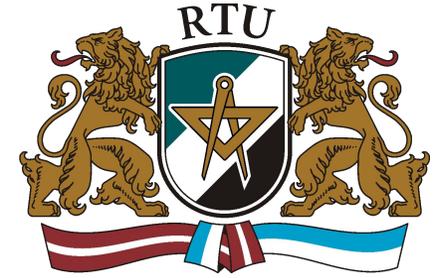


Size geometry and properties of sintered billets

Parameters	Values
Dimensions: Diameter external; internal, length (cm)	45x29x31
Density, g/cm ³	6,2
Open Porosity, %	16
Hardness HB, MPa	700
Strength at radial compression, MPa	420
Microstructure	Perlite, Sulfides, Pores;



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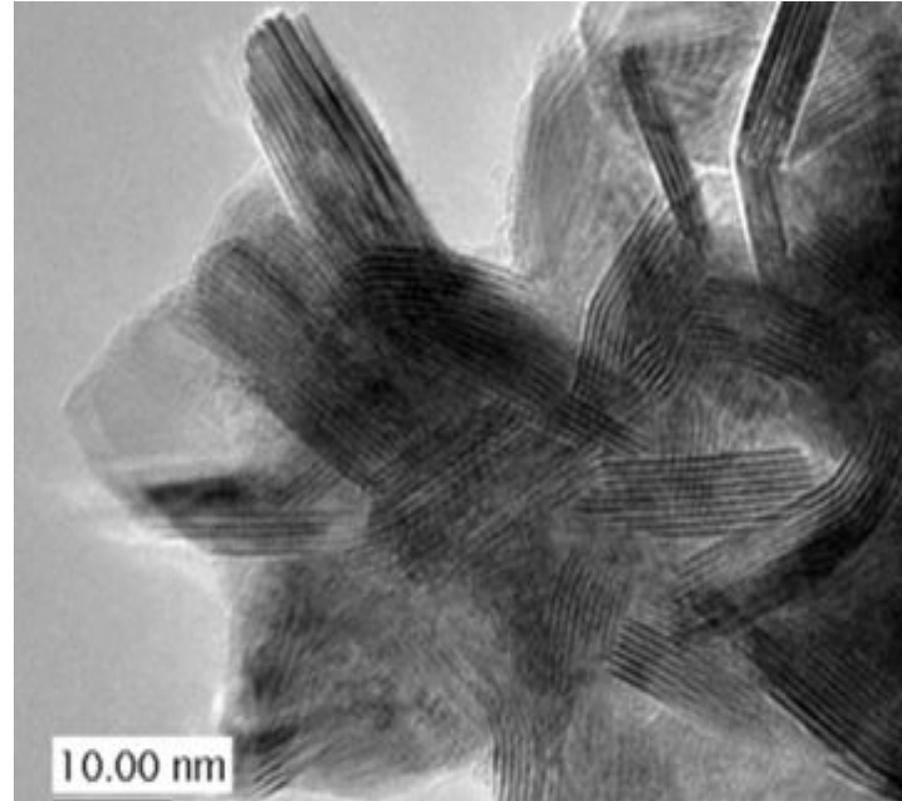
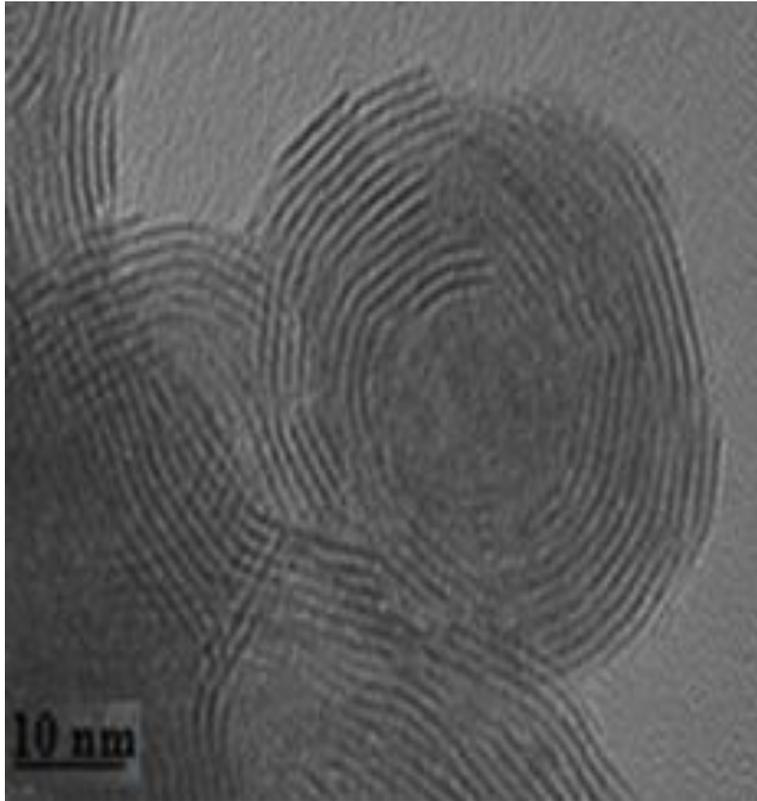


Studies using acoustic control

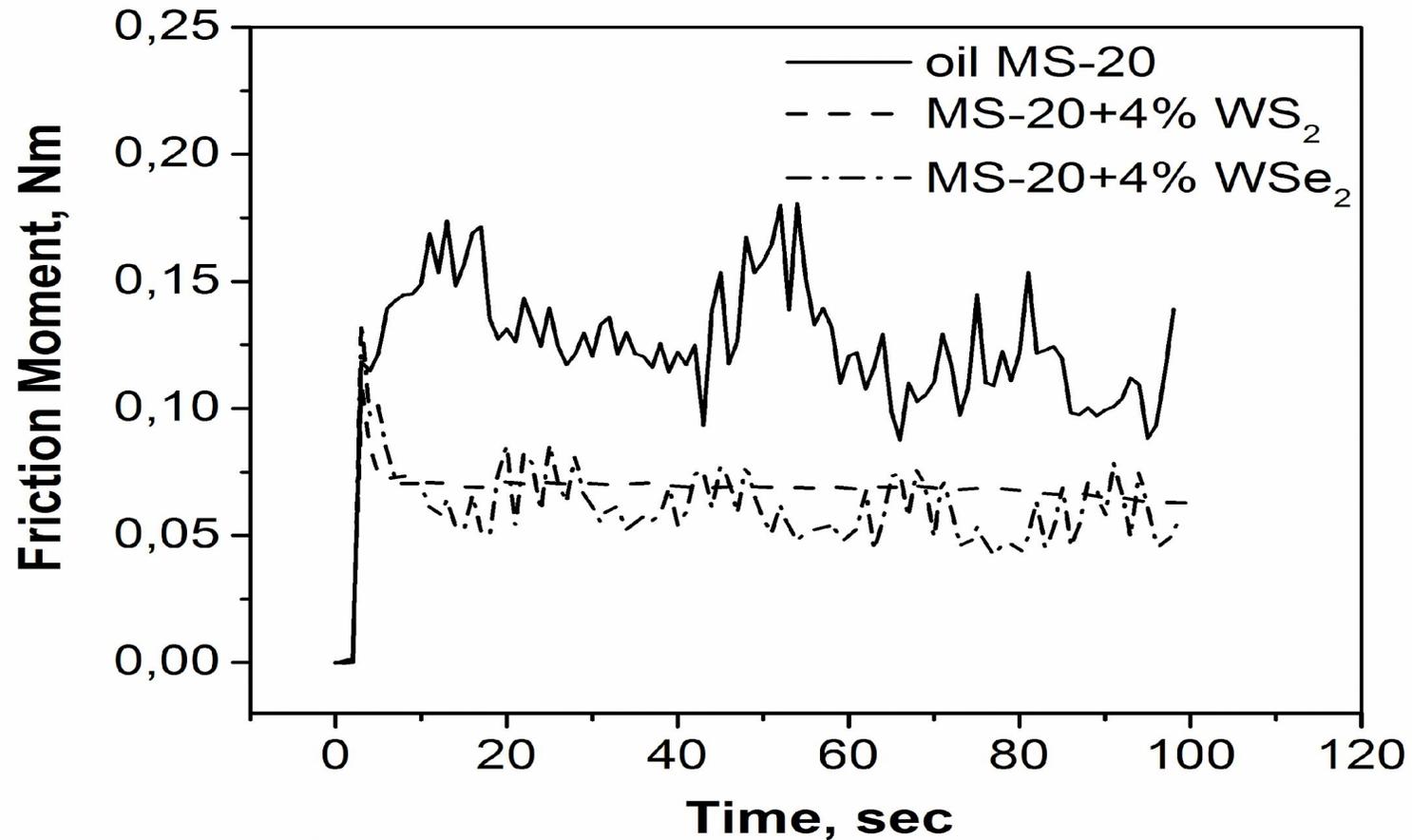


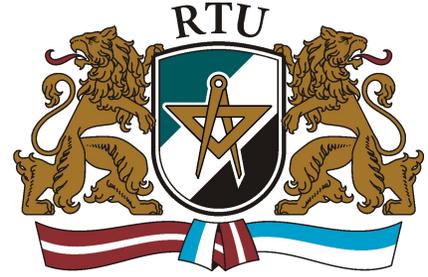
Illustration of ultrasonic measurements:
Left - the sample with a crack on the right - the application of sensors

TEM micrographs of WS₂ (a) and WSe₂ (b) nanoparticles.

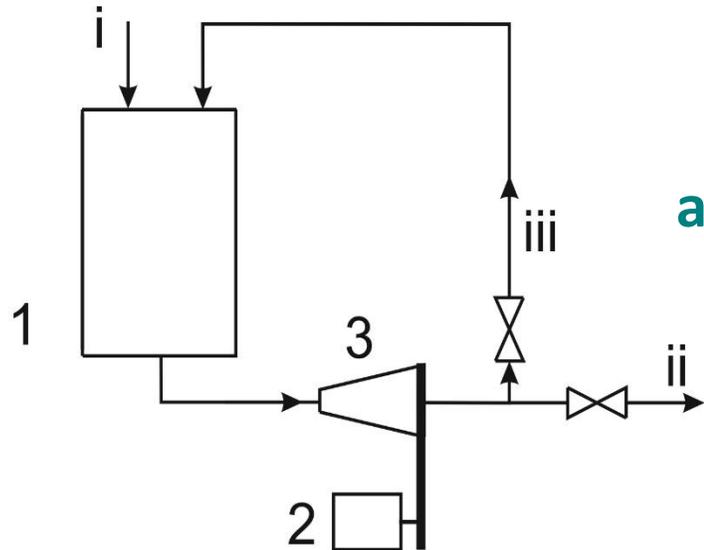


Dependence of the frictional torque versus time when testing a sleeve impregnated with mineral oil MS-20 and lubricating compositions containing 4wt.% of WSe_2 and WS_2

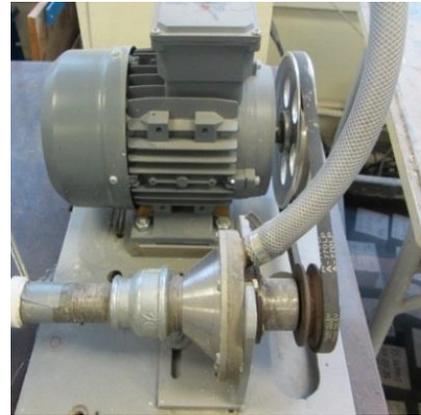




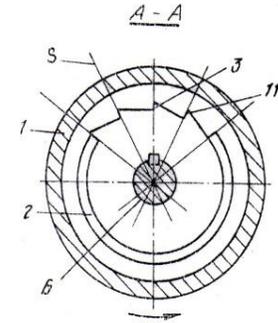
Cavitation mixer disperser



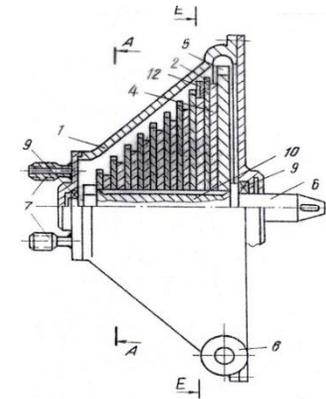
b



a



b



Multi-disk unit mixer
disperser,
a) longitudinal sections; b)
transverse sections

Experimental setup for water WCS obtaining.

General view (a) and scheme (b).

1 - container for suspension, 2 - motor, 3 -

mixer-disperser; i - supply components to be mixed;

ii - suspension output; iii - recycle stream

EQUIPMENT FOR MAGNETISATION AND MAGNETIC FIELDS METERING

- Energy up to 2,800 Ws
- Impulse currents up to 60,000 A
- Short-circuit-proof
- Short cycle times.

The magnetic field strength meter FH 55 is a compact precision instrument that measures the magnetic flux density (induction) B and the magnetic field strength H in Gauss, Tesla or Ampere/Meter.



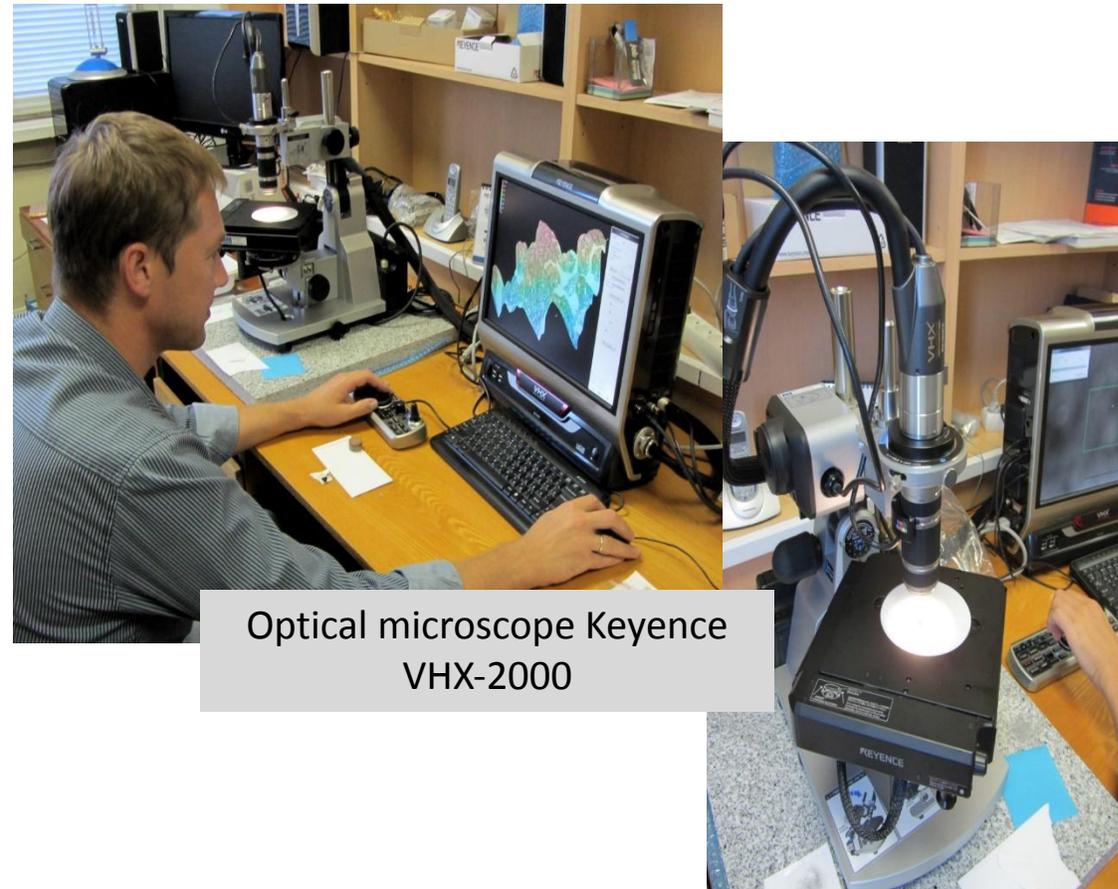
Impulse magnetizer
U-Series NC,
MAGNET-PHYSIK Dr.
Steingroever GmbH



Gauss-/Teslameter
FH-55, MAGNET-PHYSIK
Dr. Steingroever GmbH

OPTICAL DIGITAL MICROSCOPE KEYENCE VHX-2000

- VHX-2000: Keyence REMAX IV Graphics System with High-Speed processing
- 2D & 3D Automated stitching (motorized XYZ position)
- HDR High Dynamic Range
- RGB Imaging
- Super High Resolution Recording
- Optical magnification up to 5000x



Conclusions

- . The test bushings with friction on the flat base of steel cylinder have close moments of friction at brakedown and time intervals before stationary friction start, which is related to the identity of the initial conditions of friction, as well as to overlapping pores with oxide films of a certain thickness.
- 2. When the bushings is impregnated with the lubricating composition MS-20 + 4% WSe₂ and MS-20 + 4% WS₂, the average frictional torque decreases by $\approx 53\%$ and $\approx 44\%$ respectively in comparison with the bushings impregnated with MS-20 lubricating oil.
- 3. The most stable moment of friction was shown by bushings impregnated with lubricating composition MS-20 + 4% WS₂, that may correspond with the shape of nanoparticles.

**THANK YOU FOR
ATTENTION !**

