Report

Project no**. INCO-CT-2006-026283-OPSA**

Project title:

Centre of Excellence for Optical Spectroscopy Applications in Physics, Material Science and Environmental Protection

Appendix K:

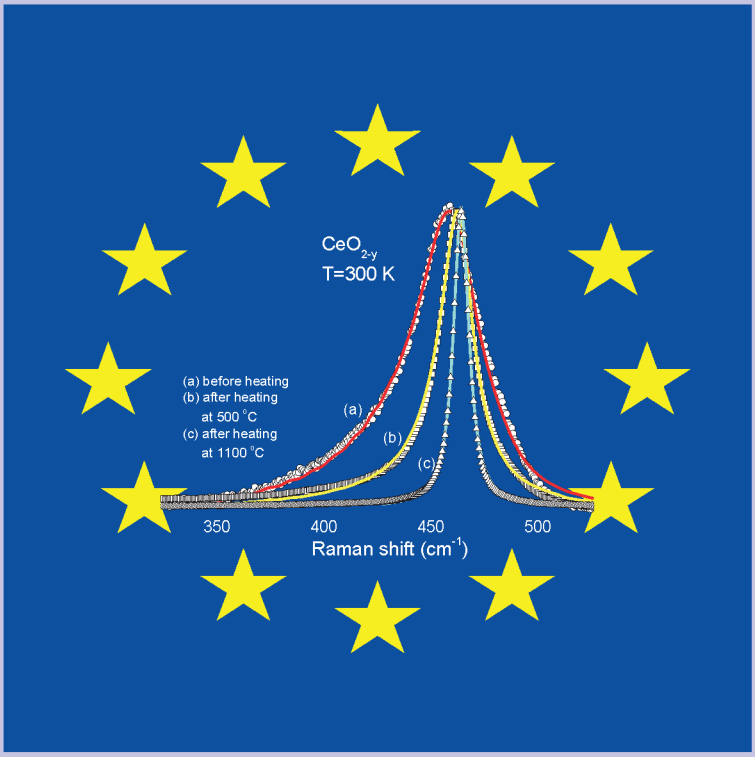
OPSA calendar

OPSA

Centre of Excellence

for

Optical Spectroscopy Applications in Physics,
Material Science and Environmental Protection



2008

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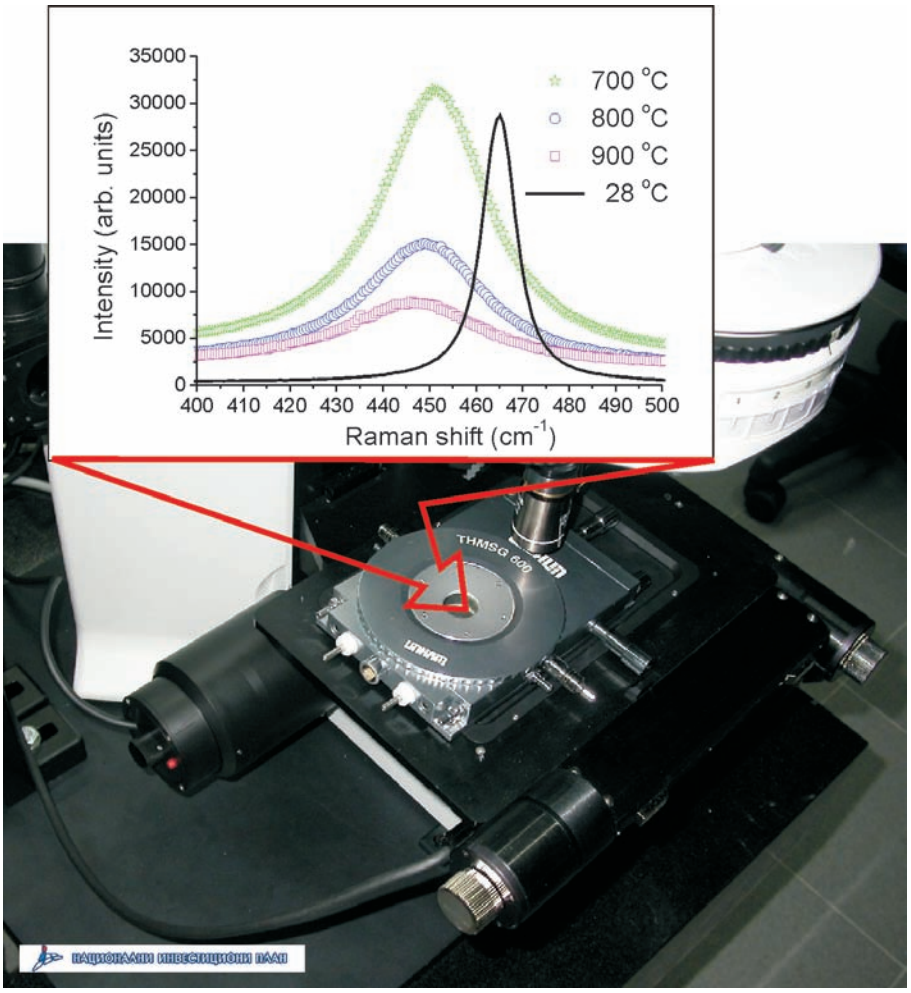

Linkam heating/cooling microscope stage incorporated into TriVista 557 micro Raman system.

January 2008

1

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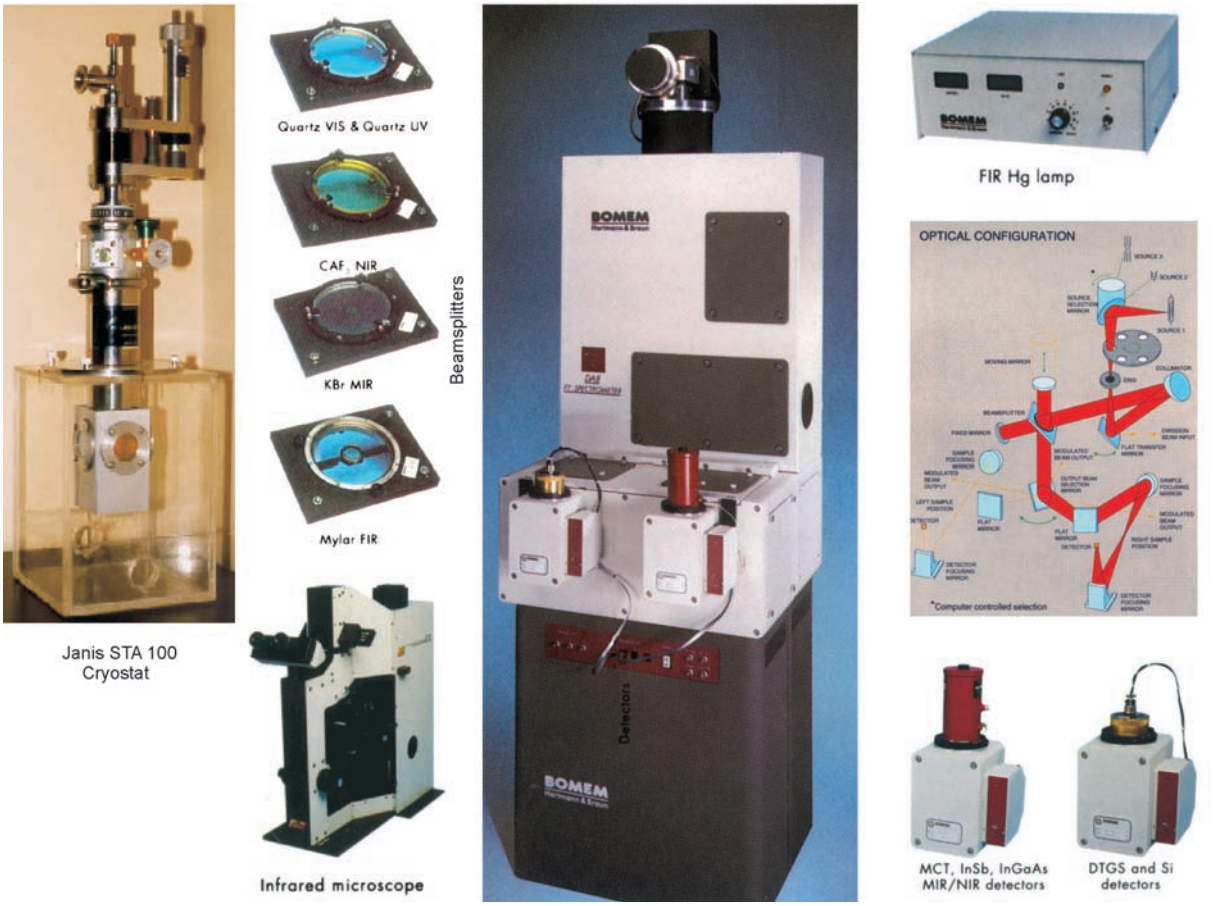

Bomem DA-8 FTIR Spectrometer with accessories. Our system allows reflectivity and transmission measurements in the 30-25000 cm^{-1} spectral range at temperatures between 4 K and 400 K.

February 2008

2

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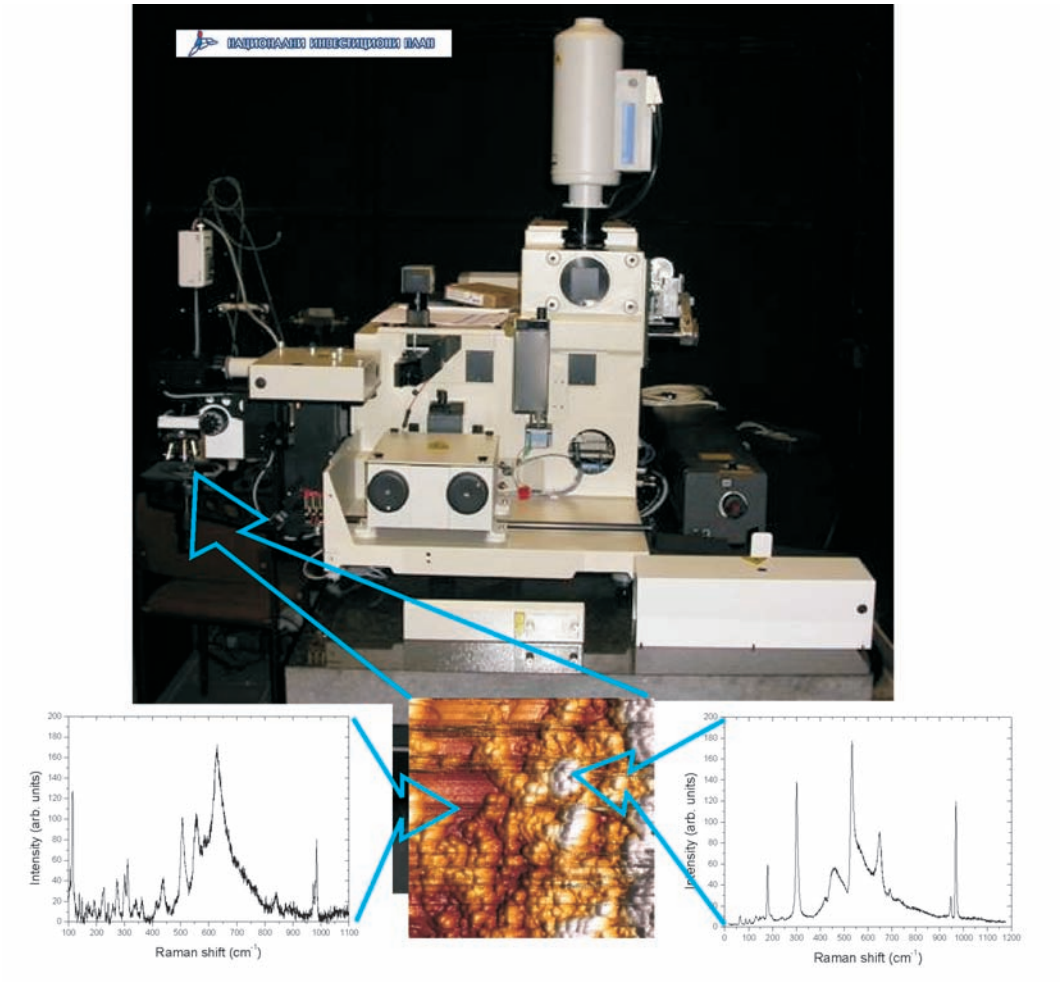

Jobin Yvon T64000 Triple Stage Raman system. An illustration of the micro Raman spectroscopy use for phase separation analysis.

March 2008

3

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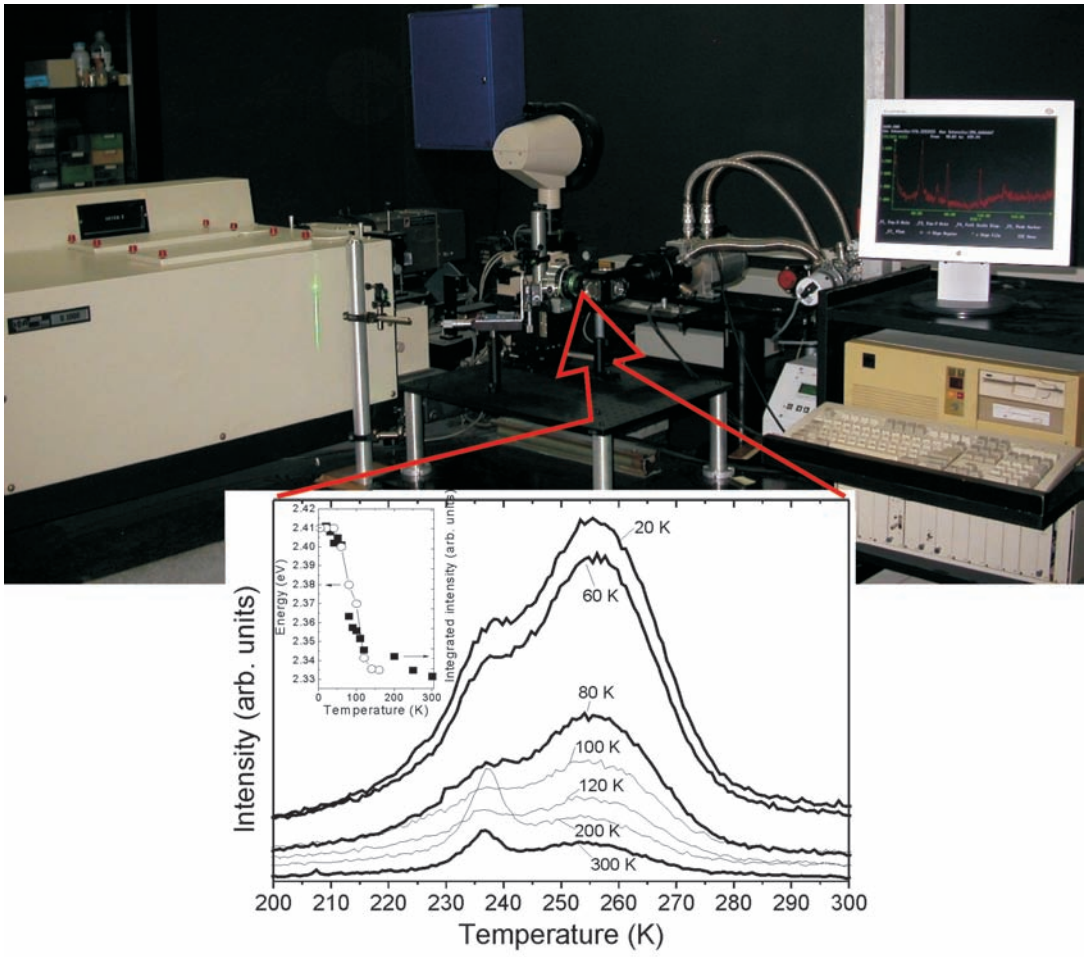

Raman scattering set-up with U1000 JY Monochromator and RCA 31034A photomultiplier as a detector. Inset: Raman spectra of MnSe at different temperatures [PRB73(2006)155203]

April 2008

4

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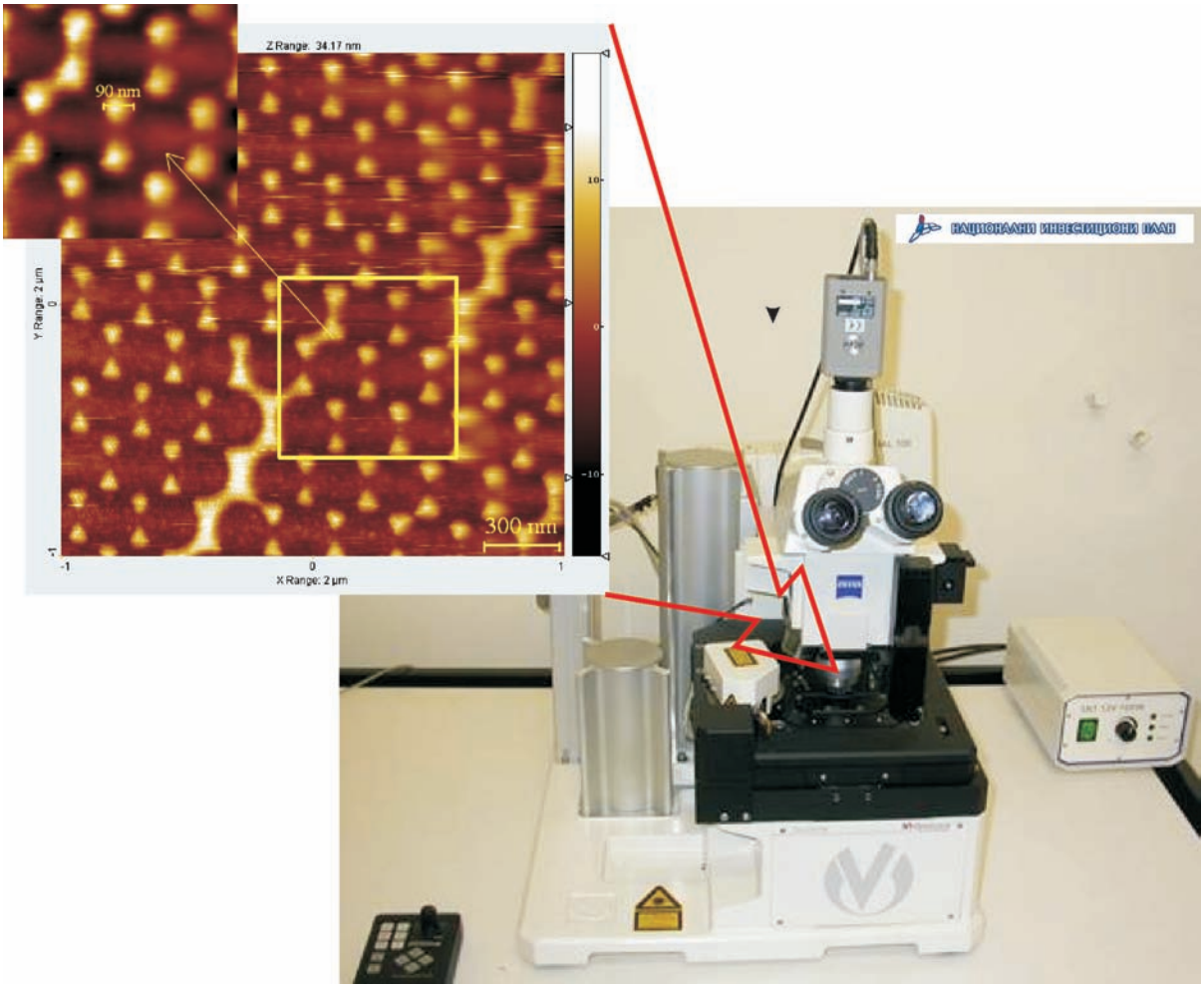

Scanning Near-field Optical Microscope (SNOM), Model Omicron TwinSNOM R. Inset: Aluminium triangles after removing of Latex spheres.

May 2008

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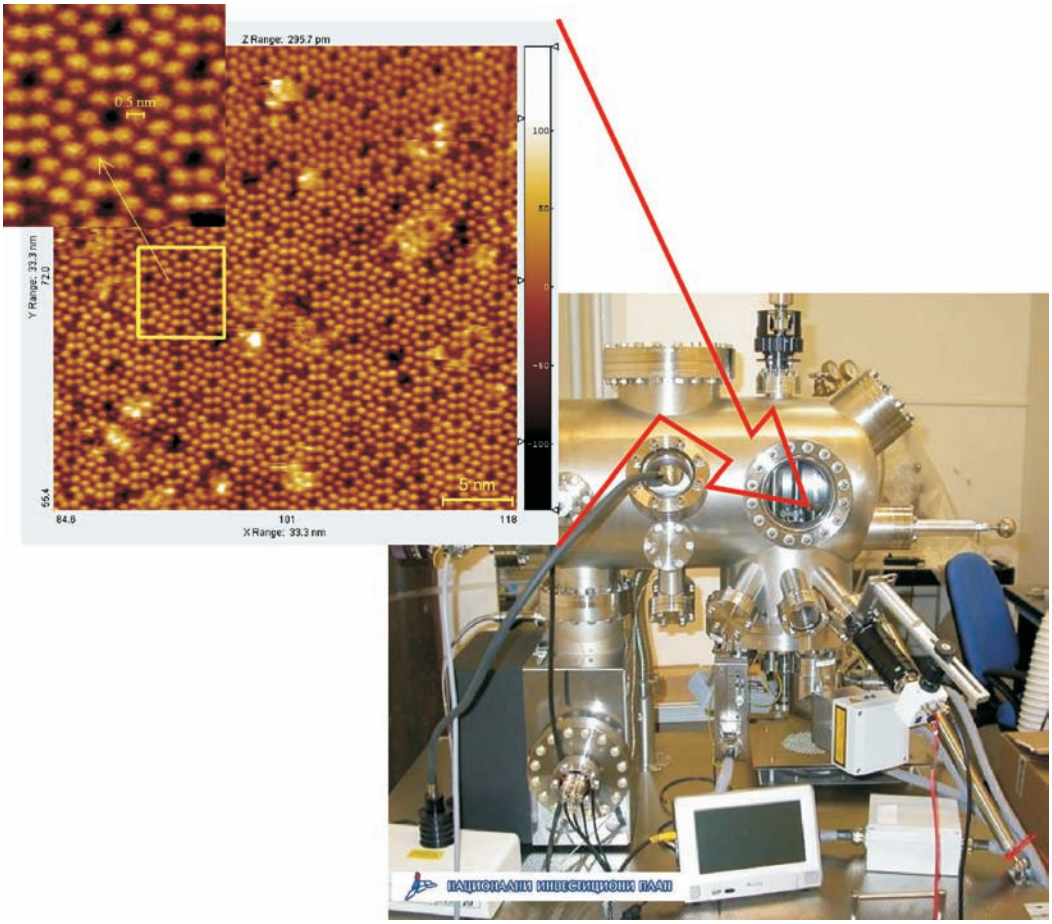

Omicron variable temperature Scaning Tunneling Microscope (STM) and Atomic Force Microscope (AFM non - contact) model B002645 SPM PROBE VT AFM 25 with MATRIX control system. Inset: Atomically resolved Si(111). 7x7 reconstruction. STM mode in high vacuum.

June 2008

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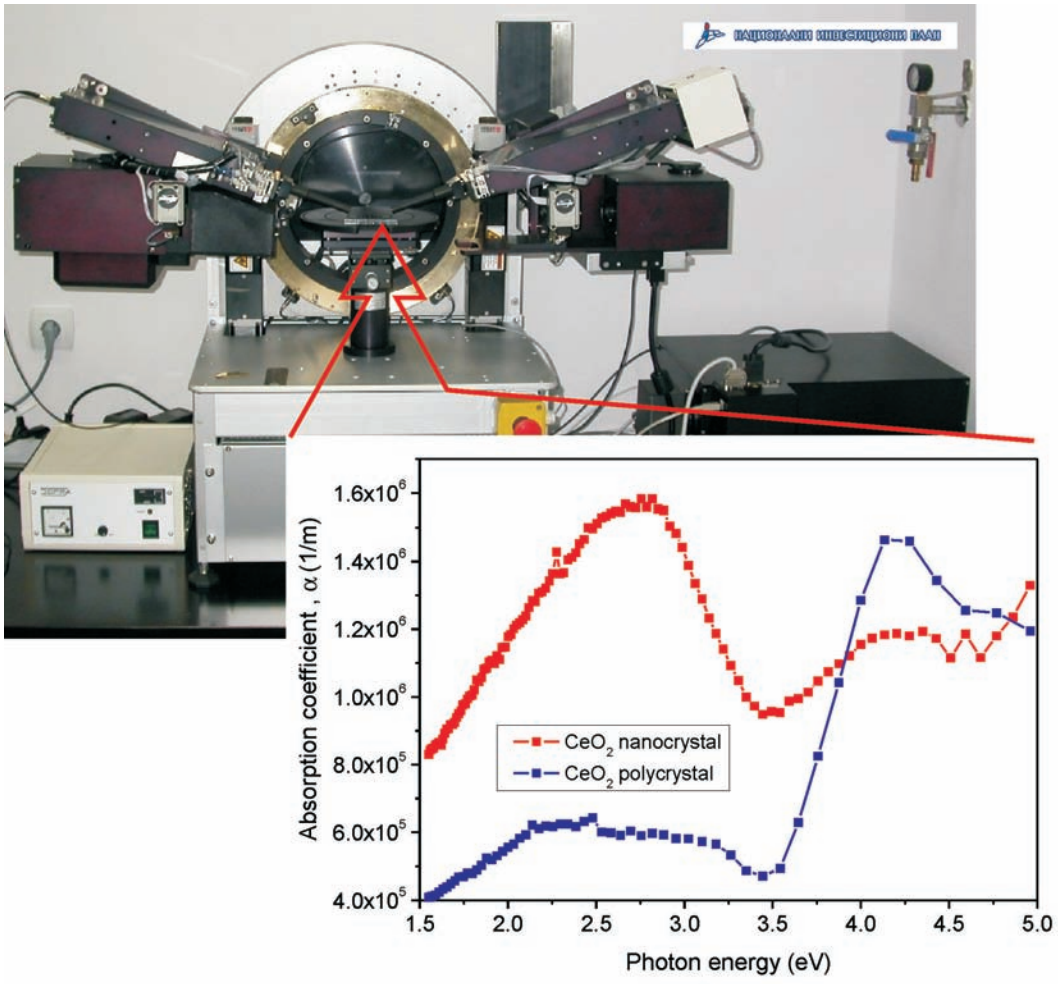

High resolution variable angle spectroscopic ellipsometer (SOPRA GES5-IRSE) for dielectric function measurements in the 190 nm -28 μm spectral range.

July 2008

7

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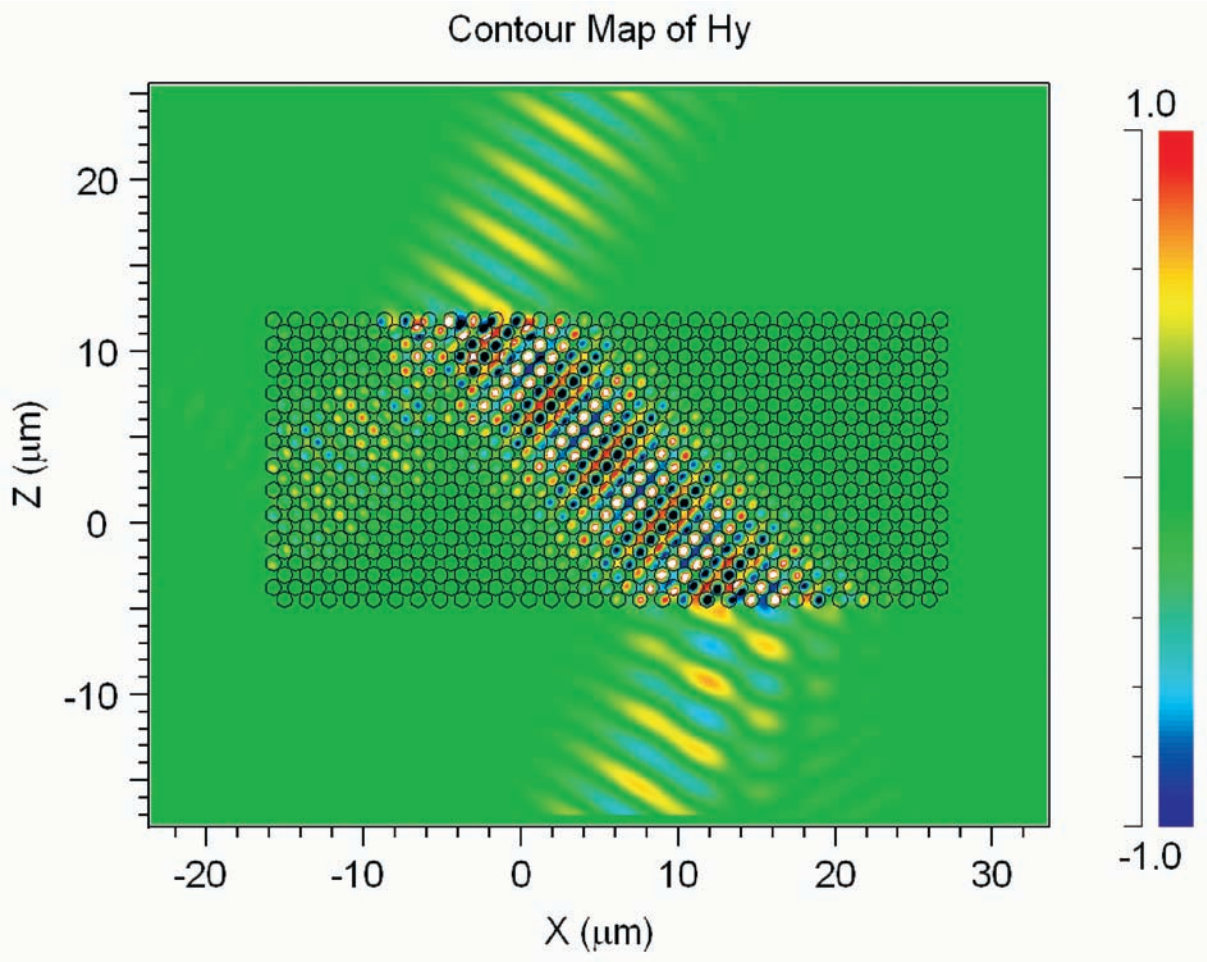

Simulation of negative refraction without reflection in 2D square lattice photonic crystal.

August 2008

8

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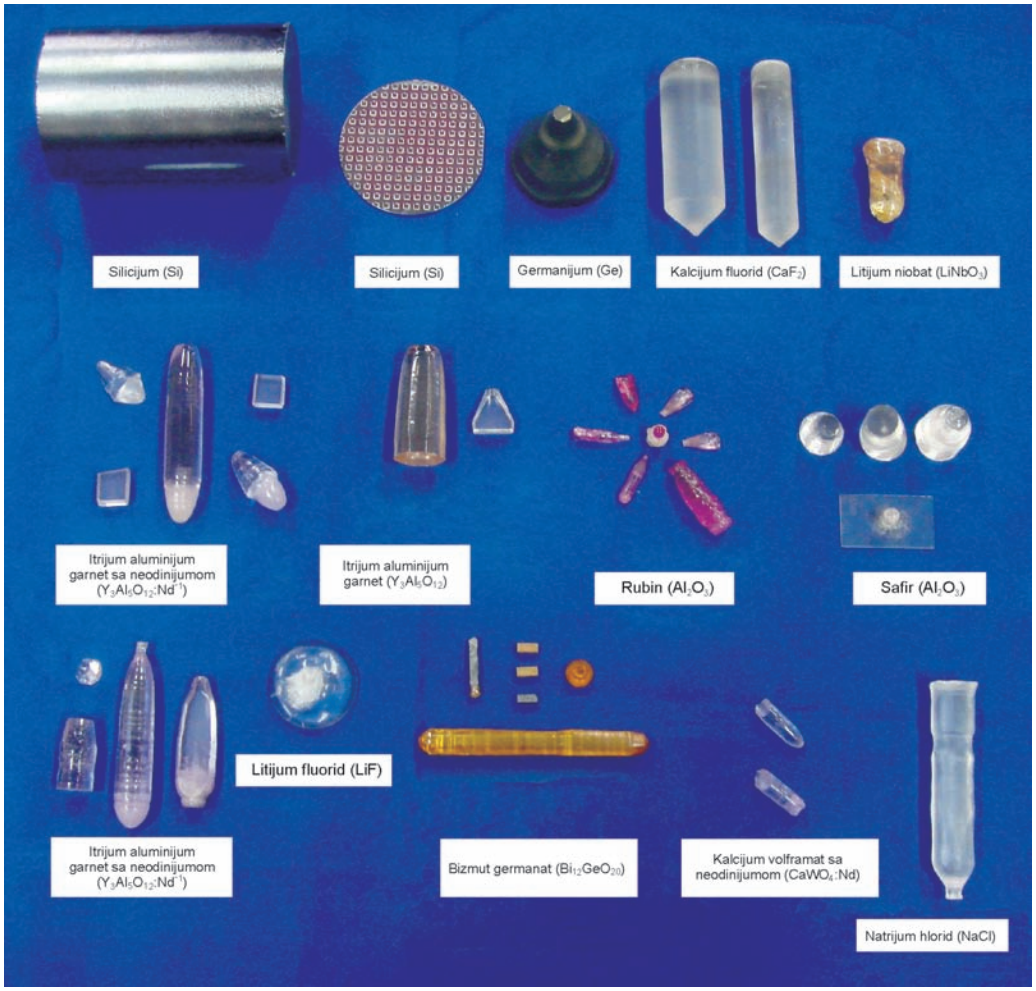

Single crystals of several semiconductors and optical materials obtained in our laboratory using the Czochralski, Bridgeman and floating zone techniques.

September 2008

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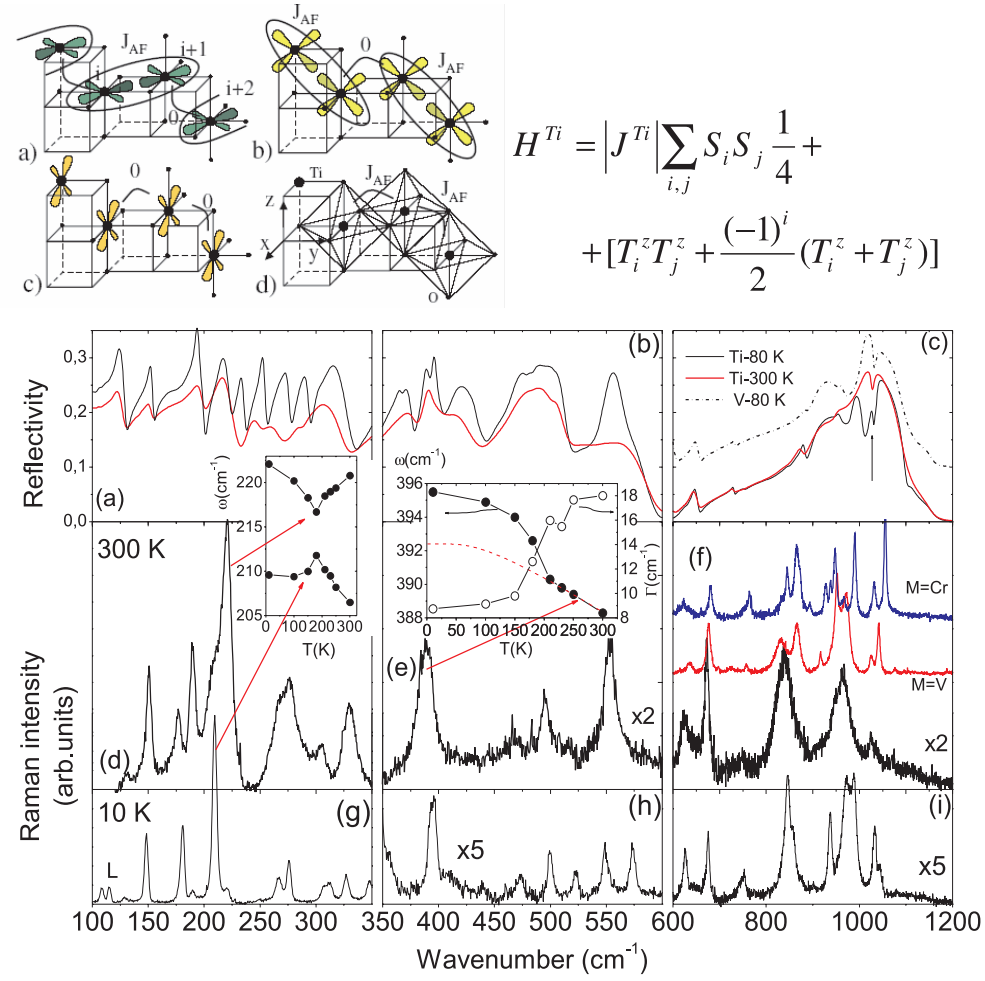

Raman and infrared reflectivity spectra of NaTiSi2O6 in orbitally ordered (10 K) and orbitally disordered (300 K) phase [PRB69(2004)020409(R)], PRB71(2005)224302].

October 2008

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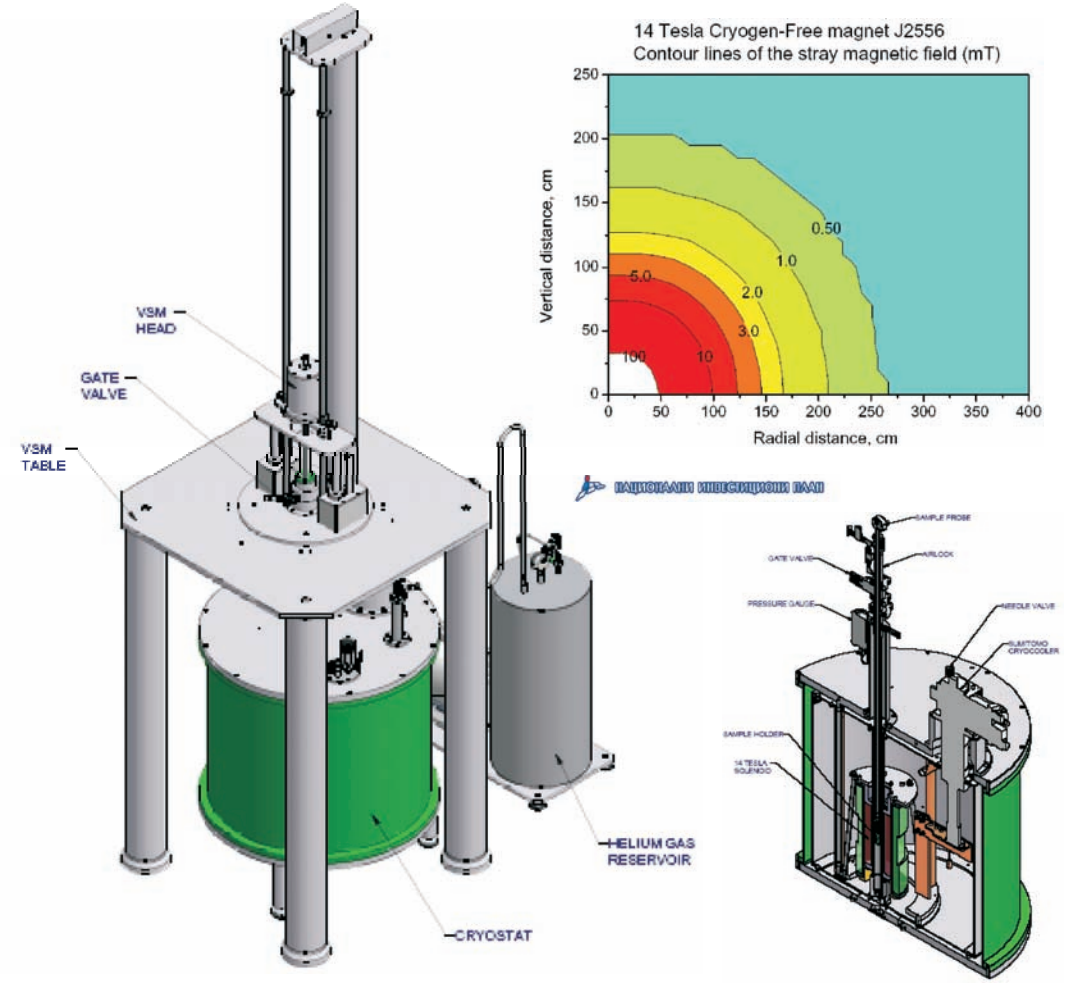

Cryogenic free 14 tesla measuring system with vibrating sample magnetometer, Hall-effect and specific heat set-ups.

November 2008

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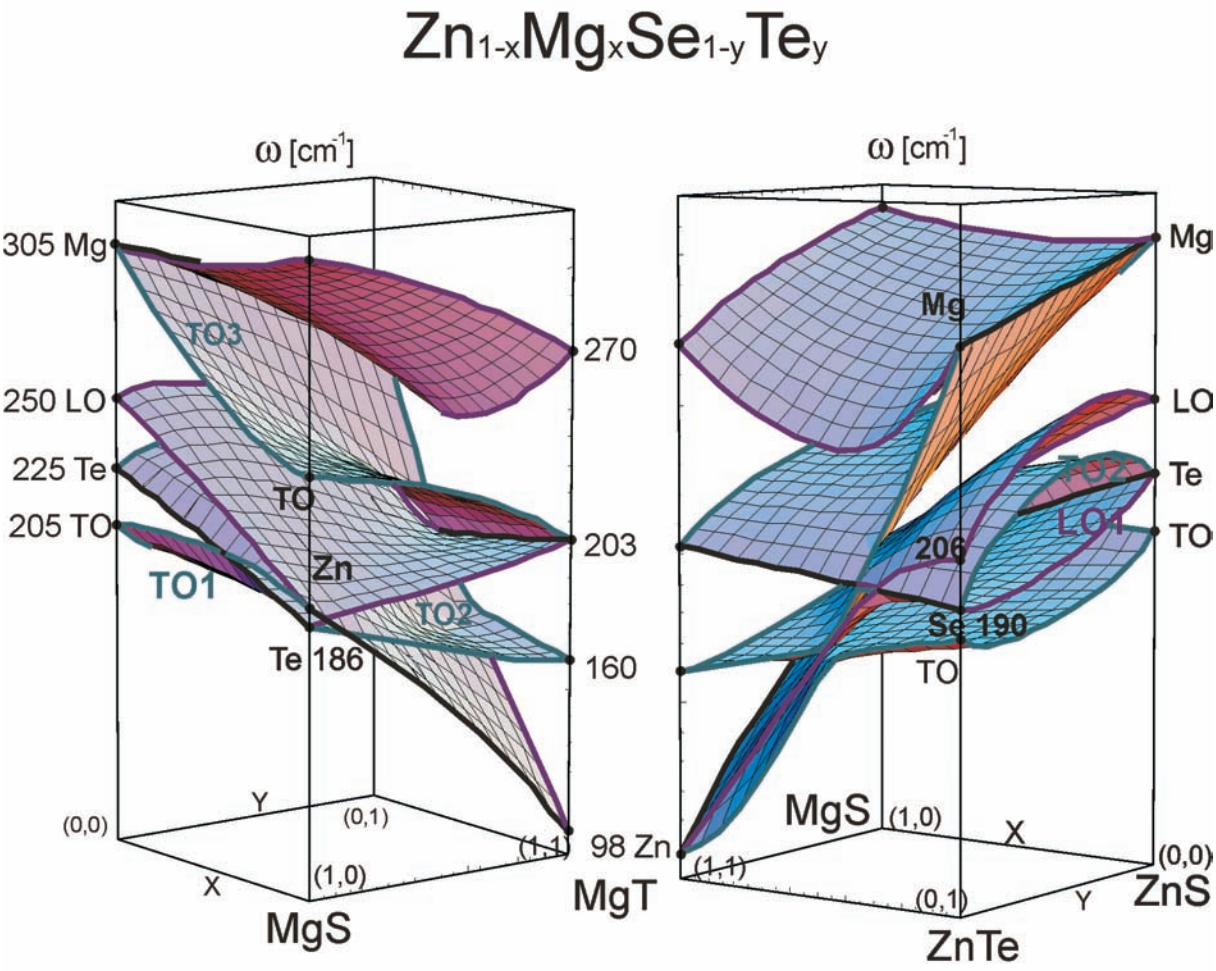

Phonon behavior in $Zn_{1-x}Mg_xSe_{1-y}Tey$ four components system

December 2008

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GENERAL INFORMATION

The aim of the OPSA project is to improve the level of scientific and technological research in the Centre for Solid State Physics and New Materials of Institute of Physics in order to become the Centre of Excellence for **Op**tical **S**pectroscopy **A**pplications (**OPSA**) in Physics, Material Science and Environmental Protection. The OPSA Centre should contribute to tightening the existing and establishing new links with European Centers in the field of applications of the advanced spectroscopy techniques in diverse fields of the natural science, through the vigorous exchange of scientists between OPSA Centre and European Institutes and Universities, international workshops and training of young scientists.
The main objectives of the Centre of excellence for OPSA are as follows:

- To promote long term research into understanding phenomena, mastering processes and developing research tools in the field of Nanoscience and Nanotechnologies through an upgrade and renew of our experimental techniques (Raman and infrared systems)
- To develop human potential by educational and training activities.
- To promote cooperative research as well as technological and educational activities between research centers, universities and industry in the field of Micro- and Nanotechnologies and Microsystems.

We expect from this project to improve the current experimental techniques concerning the sensitivity and resolution bringing this equipment to European level. By making the OPSA Centre of excellence in the Balkan region we expect to be capable of cooperating in the future programmes of European Community. Besides, through the education and training of young researchers in European laboratories, special courses in OPSA and using modern equipment in research, we expect to expand the front of excellence to the West Balkan countries, keeping the experts in the region and broadening perspectives for high level education, research and ability of employment of young people.
The OPSA project addresses the following thematic area of FP6 Programme:
3.4.1 *Nanotechnologies and nanosciences*.
In particular this project contributes to:
3.4.1.1 *Long-term interdisciplinary research into understanding phenomena, mastering processes and developing research tools*

Data about project:

INCO-CT-2006-026283-OPSA project signed on 29.06.2006

Budget:
400.000 Euros

Head of Project:
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RESEARCH POTENCIAL

Personnel resources: Center for Solid State Physics and New Materials consists of 11 researchers, 11 PhD students and 10 engineers and technicians. Presentation of our research staff including CV, main research interest and recent publications of each of them can be found at our web site: http://www.solid.phy.bg.ac.yu

Experimental facilities: The Center for Solid State Physics and New Materials consists of several laboratories:

Laboratory for crystal growth and material synthesis is equipped with several crystal growth techniques like Czochralski, Bridgeman or floating zone, thin film technology methods (thermal evaporation, spattering, laser ablation), sol-gel technology, sintering, etc.

Laboratory for photoluminescence and Raman scattering spectroscopies is equipped with double grating U1000 Jobin Yvon monochromator, Ar, Kr, He-Ne and He-Cd ion lasers, and Peltier effect cooled photomultiplier (model RCA 31034A) as a detector (single photon counting detection system). For low-temperature measurements (10K-400K) there is the Leybold closed cycle helium cryostat. This experimental set-up has an excellent stray-light rejection and allows the measurements close to the laser line.

Laboratory for micro-Raman spectroscopy is equipped with triple Jobin Yvon T 64000 spectrometer (gratings with 1800 grooves/ mm), Coherent Ar- Kr mixed gas ion laser, and CCD detection system. The set-up contains a confocal microscope and x-y-z microscope stage. For variable temperature measurements there is a KONTI – CryoVac Helium temperature cryostat, which allows the micro-Raman measurements in the temperature range between 4 and 325 K. We have also Linkam THMSG 600 heating and cooling microscope stage, which allows the micro-Raman measurements in the temperature range between 77 and 900K. Another micro-Raman set-up is TriVista TR557 spectrometer, which is a part of Laboratory for magnetooptic measurements.

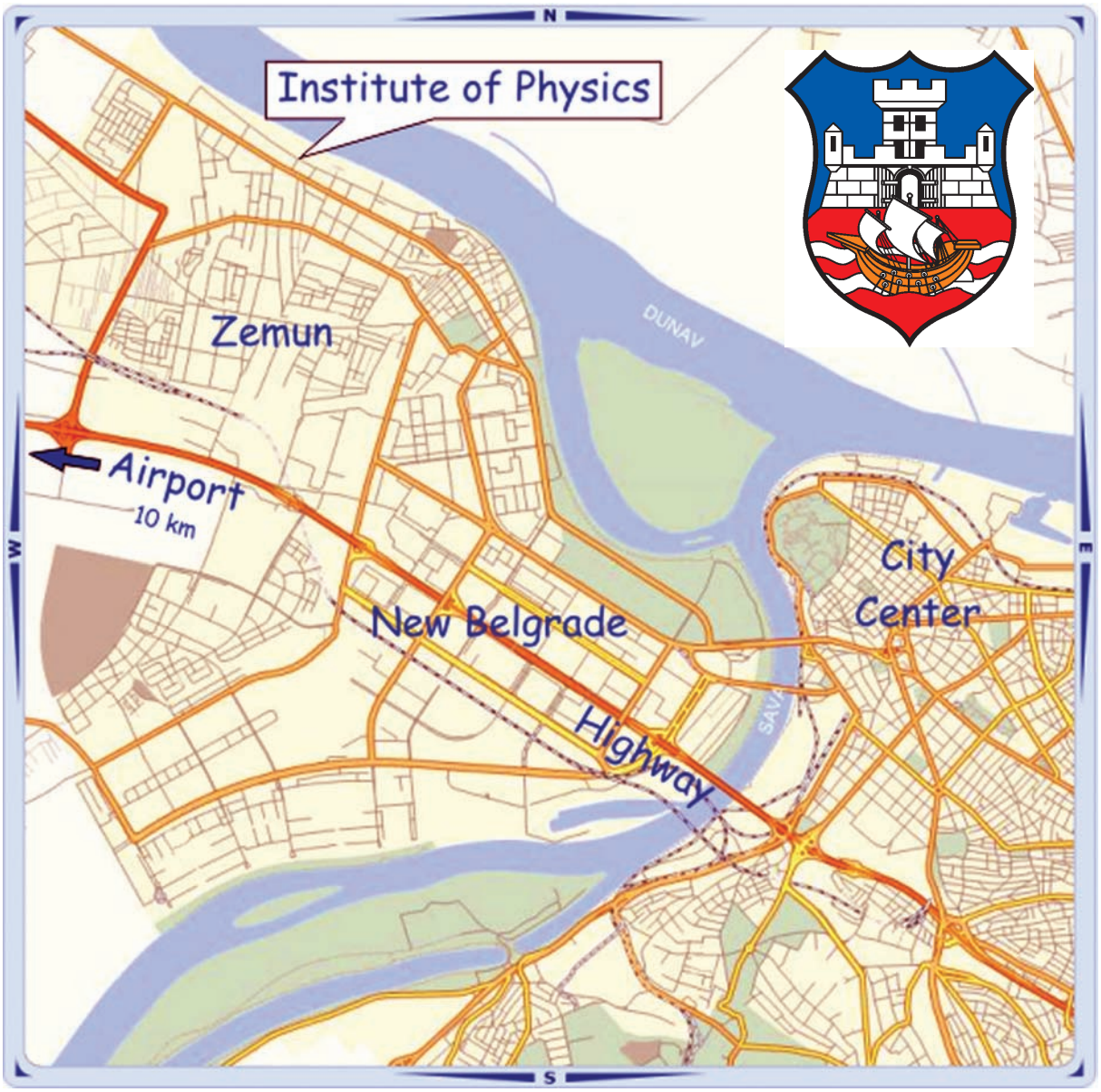
Laboratory for nanoscopy is equipped with state of art experiments for measuring the properties of materials at nano-level (Omicron variable temperature SPM and AFM, model B002645 SPM PROBE VT AFM 25 with MATRIX control system, SNOM, model TwinSNOM R).

Laboratory for Fourier transform Infrared (FTIR) spectroscopy and ellipsometry is equipped with two FTIR systems: Bomem DA-8, and SPECAC spectrometers. The first system allows the measurements in the wide frequency range (30-25000 cm^{-1}) at temperatures between 4 and 300 K. The second set-up provides the excellent conditions for the measurements in the low-frequency region (1-250 cm^{-1}) in the 77-300 K temperature range. High Resolution Variable Angle Spectroscopic Ellipsometer (SOPRA GES5E - IRSE) can measure the dielectric constants of different materials and thin films in the wide spectral range from 190 nm to 28 μm at temperatures between 10K and 400K using ARS Inc. low vibration closed cycle cryostat, Model CS204SE-X20(OM).

Laboratory for galvano-magnetic measurements (Hall effect set-up) is equipped with conventional electro-magnet (magnetic field up to 1.5 T), Hall effect set-up and ARS Displex DE-202N closed-cycle-helium cryostat (for low temperature measurements between 6 and 300 K).

Laboratory for magneto-optic and magnetic measurements is equipped with 14 T cryogen free measurements system (Cryogenic Ltd. superconducting magnet with vibrating sample magnetometer, resistivity and Hall effect set-up, specific heat system). This system has an optical window (at the bottom of cryostat base) for optical connection with TriVista TR557 triple Raman system (S&I GmbH) for low temperature and high magnetic field Raman and photoluminescence measurements.

Knowledge: This Centre offers its advanced experimental and theoretical tools: A family of optical spectroscopy (FTIR, Raman, Ellipsometry, PL) as well as nano-spectroscopy (AFM, STM, SNOM) methods. In the past, this group established a scientific collaboration on the bilateral basis with many of European laboratories, so the European funding of OPSA project would be a natural continuation of these collaborations, and should provide an essential step further towards the scientific excellence. The scientists participating in this project have published more than **350** scientific papers in well reputed international journals.



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