NEXT group
Proposal of thesis in nanotechnology field

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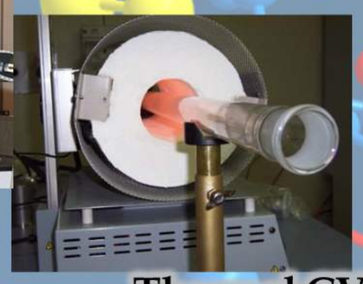
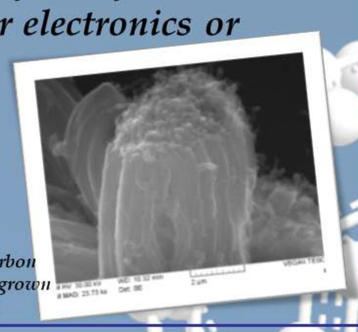
Chemical vapor deposition

Hot Filament



Thermal CVD

Carbon based nanomaterials, e.g. carbon nanotube and graphene will be synthesized and characterized by chemical vapor deposition to obtain tunable properties for electronics or biomedical application

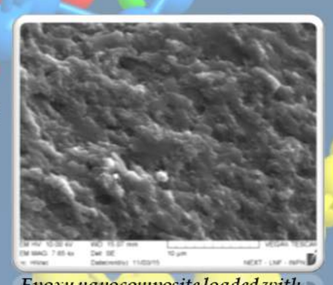


Multi-walled carbon nanotube forest grown by CVD method

Nanocomposites

Vacuum Planetary mixer

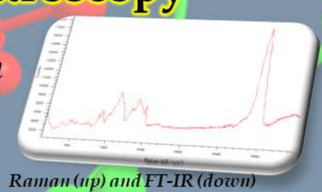
Nanocomposites based on carbon nanostructure will be prepared and characterized for testing electromagnetic interference shielding, anticorrosion, electric and/or electronic properties. Impedance broad band spectroscopy, artificial ageing, electrical test will be carried out to evaluate nanocomposite properties



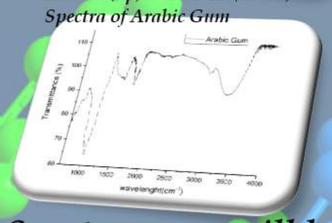
Epoxy nanocomposite loaded with 10% of MWCNT

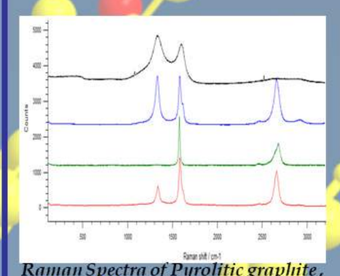
Vibrational spectroscopy

Vibrational characterization will be carried out by complementary techniques: Infrared and Raman Spectroscopy



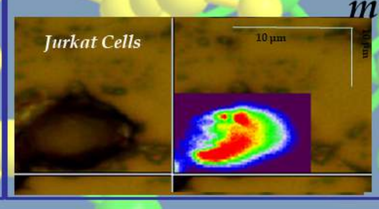
Raman (up) and FT-IR (down) Spectra of Arabic Gum

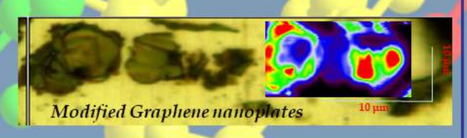




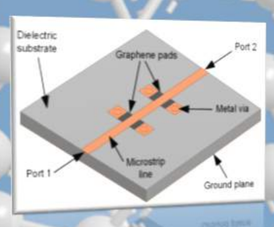
Raman Spectra of Pyrolitic graphite, rigid graphite, graphene nanoplates and Carbon nanotubes

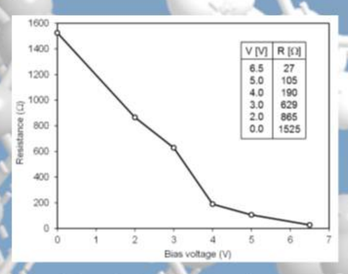
Raman Spectroscopy will be used to study different features of nanomaterials (such as functionalization and modification) or localization of nanomaterials or living systems (Raman microscopy)





Tunable antennas and attenuator





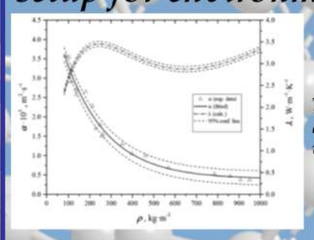
Tunability (up) and electrical response in function of gas pressure (down) of two different microstrip devices

Bottom-up fabrication of microstrip-like circuit where few-layer graphene nanoplatelets are used to contact two microstrip lines. Different configuration will be developped to minimize the reflection contribution and study the electrical properties or the tunability of microstrip attenuator

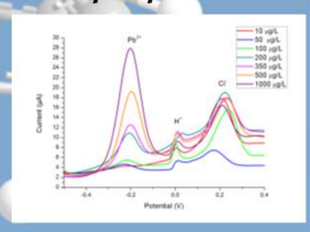
Graphene paper

Graphene paper (up) and experimental setup: flash method (left) and column for water purification (right)

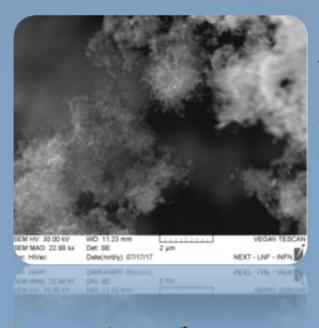
Free standing sheet of graphene nanoplates will be produced in laboratory to evaluate physical and physico-chemical properties.
Up to now, thermal properties were studied by flash method in function of material density.
Moreover, physico-chemical affinity to inorganic and organic compounds was tested to realize a setup for environmental remediation purpose



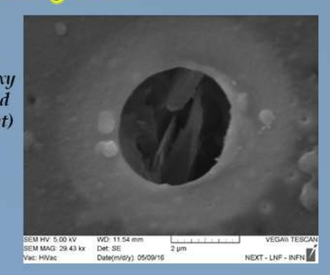
Thermal properties (left) and lead absorption from water (right)



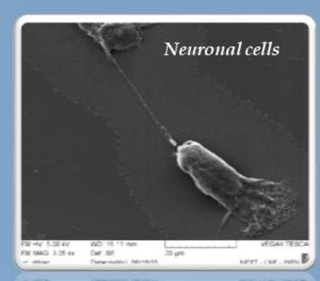
Scanning electron microscopy and elemental analysis



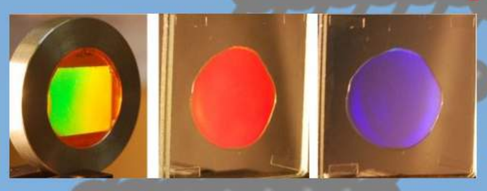
MWCNT grown on GNP (left) and epoxy nanocomposite load with 2% GNP (right)



Scanning electron microscopy will be carried out to study the morphology and structure of nanomaterials and/or living systems.
Elemental analysis will be associated to identify different materials or chemical compounds.



Photonic crystals



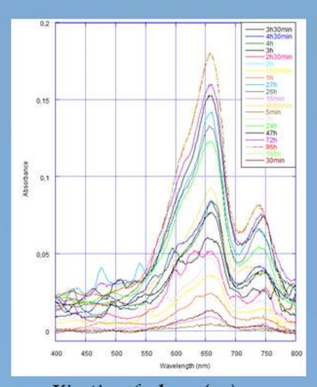
Diffraction of light by polimeric grating: Ag NP (a), LaPO4 NP (b), TiO2 NP (c) (courtesy NASU, Kiev)

Photonic crystal (PC) structures formed by a periodic distribution of nanoparticles in polymer matrix for highly sensitive detection of chemical and biological agents will be developped.
Nanocomposite based on rare earth oxide/graphene will be prepared to improve and/or enhance optical and plasmonic properties. Different approaches (such as impregnation, synthesis assisted by microwave, spin coating of a rare earth oxide/graphene dispersion in a polymer) will be studied

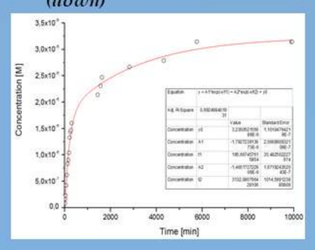
Drug delivery systems

Unstable and stable GNP dispersion

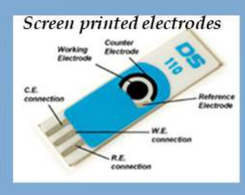
Nanocarbon based carriers will be studied to realize drug delivery systems.
Stabilization of nanocarbon in water or different solvent will be optimized.
Isothermal absorption and release kinetics will be studied in function of thermal, ionic strength and pH stimuli to evaluate loading and release rate.



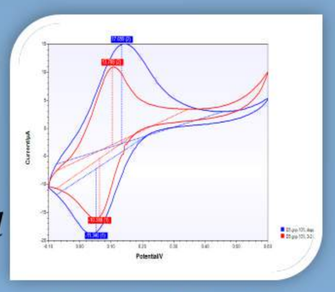
Kinetics of release (up) and non linear regression (down)



Electrochemical characterization



Screen printed electrodes will be modified to obtain sensitive and selective electrochemical sensor. Different materials (e.g. nanocomposite, nanomaterials pristine or functionalized, self assembly monolayer) will be used to modified working electrode. Electrochemical impedance spectroscopy and cyclic voltammetry will be performed to characterize electrodes



CV (up) of modified SPE and comparison among several modified SPE (down)