SHARED RESEARCH FACILITIES

The BioNano Research Facility (BNRF)

Huiyuan Li, Kristin Krumenacker, Jordan Taylor

380 Chemistry Research Laboratory building and G75E Engineering Science Building, West Virginia University, Morgantown, WV 26506

Introduction

The BioNano Research Facility (BNRF) consists of equipment on Evansdale and Downtown campuses that facilitate research at the intersection of biology and nanomaterials. The BNRF has been in operation since 2012. It is funded by the National Science Foundation EPSCoR Research Infrastructure Improvement Cooperative Agreement #1003907, the state of West Virginia (WVEPSCoR via the Higher Education Policy Commission) and the WVU Research Corporation.

Our Goal

The BioNano Research Facility is part of the WVU Shared Research Facilities (SRF). SRF provide students and postdoctoral researchers with the opportunity to use cutting-edge materials, science and engineering equipment. SRF are open to all researchers and provide training, guidance and assistance in operating the instruments and perform routine maintenance.

Our Services

We provide:

1. Safety training (General safety training/Chemistry safety training, and Biosafety training)
2. Critical Instrumentation and technique training
   - 2-week hands-on cell culture basic training (preparing media, starting cells, culturing cells, splitting cells, use of microscopes/centrifuge, cell number counting, setting up plate, preserving cells)
   - Cytotoxicity assays
   - Use of Fluorescence Microscope
   - Fluorescence dying procedure
   - Use of Spectrofluorometer
   - Mass Spectrometer basic training (preparing mobile phase, use of control software, method development)
   - Mass Spectrometer application training (such as small molecule/protein identification and quantification, metabolomics, and proteomics)
3. Data acquisition and analysis
4. Paid service for your experiment

Cell Culture

Provide basic cell culture, relative sample preparation and assays equipment.

Our equipment:
- CO_2 incubator
- Biosafety cabinet
- Cryogenic storage system
- Centrifuge with temperature control
- Millipore water purification system
- UV-Vis microplate spectrophotometer
- Digital inverted microscope
- Autoclave

Applications:
- ❑Assess the cytotoxic effects of nanoparticles or small molecules.
- ❑Detect the effect of nanopatterns on cells morphology, proliferation, adhesion and migration.

Fig. 1. Examples of cell culture experiments

Mass Spectrometer

Identification and quantification of small molecules, peptide/proteins, oligonucleotides from synthetic or biological sources

Thermo Scientific Q-exactive
- Ion Max API source
- Quadrupole Mass Filter
- Orbitrap Mass Analyzer

UHPLC
Easy-nLC 1000

Resolving power up to 140,000
Maximum scan speed 12 Hz
High resolution accurate mass (HRAM)
Full mass scan, all ion fragmentation, data dependent fragmentation capabilities

Fig. 2. Example of mass spectrum.

Applications:
- ❑Synthetic oligonucleotide identification
- ❑Identification the protein phosphorylation site
- ❑Study of the aggregation status of amyloid protein
- ❑Metabolomic profiling

Fluorescence Microscope

Monitoring dynamic cellular processes in living specimens or fixed samples

Leica DMI 6000 with DFC300FX Camera

Fluorescent filters: GFP, RFP, CY5, DAPI

DIC, Brightfield and polarizers

4x, 10x, 20x, 40x, 63x objectives

Monochrome camera 1392×1024

Applications:
- ❑Image cellular update and localization of nanoparticles
- ❑Test the fluorescent properties of synthetic molecules in cell culture environment
- ❑Detect amyloid protein aggregation pattern

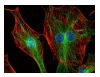
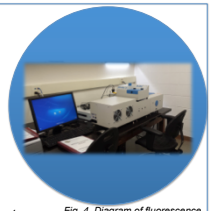


Fig. 3. Example of cells fluorescence image.

Spectrofluorometer

Investigation of fluorescence properties of a sample when irradiated with UV, visible or near-IR light.



Horiba Jobin Yvon Fluorolog-3 Spectrofluorometer

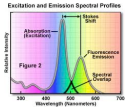
Steady state wavelength measurements 230nm to 1550nm

Lifetime wavelength measurements 250nm to 900nm

Temperature bath for -25 to 150 C

Cuvette, thin film, multiwell plate sample holders

Fig. 4. Diagram of fluorescence excitation and emission spectral profiles.



http://www.olympusmicro.com/primer/lightandcolor/fluoroexcitation.html

Applications:
- ❑Study the fluorescence of nanomaterials
- ❑Detect the aggregation dynamics of amyloid proteins

How to become a user?

All researchers including undergraduate students, graduate students, faculty, and staff, as well as external researchers from government and industry are welcome.

Please contact us for your safety training and instrumentation training. All trainings are free of charge. After training, you can reserve the instrument through our Facility Online Management (FOM) system and come to the lab to perform your experiment.

Where to find us?

We have two labs on different campuses:

Main facility: 380 Chemistry Research Laboratories Building (Downtown campus)

Annex facility: G75E Engineering Sciences Building (Evansdale campus)

Find more information about our facility in our website:

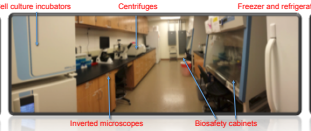
http://sharedresearchfacilities.wvu.edu/

Contact Us

Huiyuan Li, Ph.D.
BioNano Research Facility Manager
Huiyuan.Li@mail.wvu.edu
304-293-0747

Trina Wafle
Director of Program Operations
TKWafle@mail.wvu.edu
304-293-6038

Main facility: Mass Spec and sample prep room



Main facility: Cell culture room

Main facility: Fluorescence microscope and Spectrometer room

Annex facility: Cell culture room

WestVirginiaUniversity.

NSF

WVEPSCoR Science and Research West Virginia Higher Education Policy Commission

NANOSAFE