



Contribution ID: 94

Type: **Poster**

## Brookhaven Linac Isotope Producer status and Pre/Post-irradiation characterization and analysis capabilities at BNL

*Tuesday, 7 November 2023 17:32 (1 minute)*

The characterization of material microstructure and macrostructure effects due to radiation and extreme conditions utilizes proton/ion beam irradiation facilities, Brookhaven Linac Isotope Producer (BLIP) and beams from a Tandem van de Graff facility, extreme temperature studies at the Center of Functional Nanomaterials (CFN), and effects due to extreme (high dose rate) x-ray environment at special beamlines at the National Synchrotron Light Source (NSLS-II) at BNL. The co-location of these facilities at BNL enables comprehensive characterization of material effects under the extreme conditions enabled by these facilities.

The Brookhaven Linac Isotope Producer (BLIP) operations have been ongoing for over fifty years for isotope production augmented with proton and spallation-based fast neutron irradiation studies of particle accelerator and nuclear materials. The program has maintained the handling and characterization capabilities of highly radioactive materials. Specifically, capabilities within the BNL hot cell laboratory, essential for nuclear material studies, include photon spectra and isotopic analysis using high-sensitivity detectors, radioactivity measurements and high precision weight loss or gain assessment. Also, the program is supporting the RaDI-ATE collaboration and the U.S.-Japan Science and Technology Cooperation Program in High Energy Physics. In the very near future an intensity upgrade will be under way at BNL to increase the 200 MeV Linac up to 250  $\mu$ A peak current it can deliver after its upgrade.

The Center of Functional Nanomaterials (CFN) has hosted a broad range of research investigations in nanoscience since its inception in diverse research areas, such as efficient catalysts, fuel cell chemistries and architectures, and photovoltaic (solar cell) components. The CFN consists of 7 facilities that provides access to state-of-the-art material characterization and synthesis tools to a scientific community (currently on unirradiated materials).

- Advanced Optical Spectroscopy and Microscopy
- Advanced UV and X-ray Probes
- Electron Microscopy Facility
- Materials Synthesis and Characterization Facility
- Nanofabrication Facility
- Proximal Probes Facility
- Theory and Computation

The National Synchrotron Light Source II (NSLS-II) has developed world-class x-ray capabilities for studying complex and heterogeneous materials, including robotics, that allow it to work with radioactive materials with dose rates up to 100 mrem/h at the XPD beamline. Furthermore, BNL is working with DOE-Nuclear Energy on a concept for a beamline with an end station separated from the ring building, controlled access, special capabilities to receive and study radioactive materials with higher dose limits than at any synchrotron beam line within the DOE complex. The initial scope of this special beam line facility will be on structural analysis and tomography but will have the ability to be upgraded to include chemical imaging.

### Themes for the contribution

- 1 R&D to support concepts

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**Session Classification:** Poster session