NSTX-U

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Surface Science Collaboration

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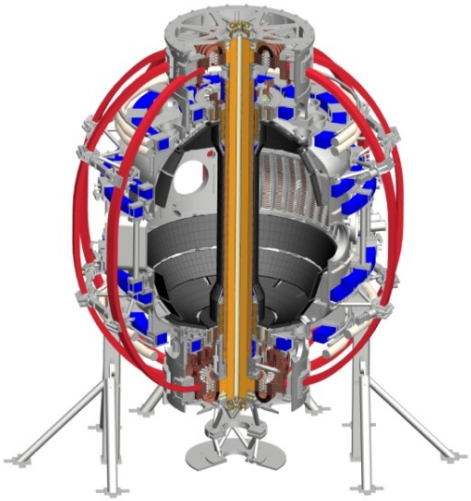

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Fundamental surface science of PFCs for improved plasma performance in NSTX-U

Timetable of Activities Year 1:

- Synthesize and characterize Li-C deposits *(Surface Science and Technology Laboratory (SSTL))*
- Migration of impurities through solid and liquid Li films *(SSTL)*
- Elementary rates of adsorption, scattering, and recombination for interactions of D_2, D atoms, and D^+ ions with Li-C deposits *(SSTL)*
- *High resolution electron and ion spectroscopy (HR-XPS, LEIS, RBS) to elucidate surface chemistry of Li/ B MAPP samples (Laboratory for Surface Chemistry (LSC))*
- *Collaboration to operate MAPP (Coordinate with JP Allain)*

Year 2:

- Temperature dependence of D uptake and retention in mixed Li-C deposits *(SSTL)*
- Compare experimental results to quantum-classical MD calculations by P Krstić
- Synthesis and characterization of Li/O/B/C deposits *(SSTL)*
- Li wetting on TZM and stainless steel using Scanning Auger Microprobe (SAM) *(Surface Imaging and Microanalysis Laboratory (SIML))*
- Bulk oxidation of lithium layers *(SULI project 2014)*
- *Surface spectroscopy to complement MAPP analysis*

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Year 3:

- Temperature dependence of D uptake and retention in Li/O/B/C deposits *(SSTL, some preliminary results already)*
- Removal of oxidized lithium layers by reactive gases *(SSTL)*
- Li wetting on TZM and stainless steel *(SIML, some preliminary results already)*
- *Surface spectroscopy to complement MAPP analysis*

Year 4:

- Expand characterization and surface chemistry studies to more complex mixed deposits *(SSTL)*
- Effect of D, O, and C on wetting and adhesion of Li *(SIML)*
- Surface science studies of Sn and Sn-Li alloys *(SSTL)*
- *Surface spectroscopy to complement MAPP analysis*

Plans for 2015 run

- Use HR-XPS and other spectroscopies to elucidate chemistry of lithiated and boronized samples

  Do beneficial Li / B effects correlate with Li / B surface composition?

- Use samples exposed by MAPP; transport samples to SSTL, SIML, and LSC in Ar atmosphere
- Initially day-long exposures. Correlate with individual discharge conditions when MAPP probe drive is automated
- Piggyback on runs for other XPs for the most part
- Low triangularity discharges preferred to increase flux on MAPP samples
- Detailed analysis of coupons and tiles retrieved at end of campaigns