Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

NSTX-U Research Goals and Plans for Materials and Plasma-Facing Components[1] R. KAITA, A.M. CAPECE, M.A. JAWORSKI, B.E. KOEL, J.P. ROSZELL, C.H. SKINNER, D.P. STOTLER, PPPL, NSTX TEAM — A major need for NSTX-U is plasma facing components (PFCs) that can survive heat and particle fluxes that result from increasing the maximum heating power to 19.2 MW, which leads to one of highest divertor PFC power densities in the world. This is expressible as the ratio of heating power to major radius of about 21 MW/m, which NSTX-U PFCs are expected to withstand for five to eight seconds. From the perspective of materials and PFCs, this challenge is being addressed through research in three major areas. 1) Understanding why lithium is effective for PFC conditioning, and determining its suitability for long-pulse discharges. Surface analytic techniques are thus being applied to study the complexes that are formed when lithium is deposited various substrates. 2) Investigating erosion and re-deposition of PFCs, including research on lithium-conditioned materials in linear plasma devices that simulate particle fluxes to tokamak walls. 3) Developing techniques for mitigating plasma-surface responsible for reducing wall lifetimes, such as continuous vapor shielding. Present plans are to change NSTX-U PFCs gradually from low-Z carbon to high-Z metallic PFCs. Liquid metals may provide the only long-term PFC solution, and a program to develop flowing lithium PFCs has been initiated.

[1]Work supported by DOE Contract No. DE-AC02-09CH11466

Robert Kaita
Princeton Plasma Physics Laboratory

Date submitted: 12 Jul 2013 Electronic form version 1.4