Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Gas-phase chemistry and plasma characterization during pulsed laser ablation of boron-rich targets[1] SHURIK YATOM, YEVGENY RAITSES, Princeton University , Princeton Plasma Physics Lab — In this work, we compare the gas-phase chemistry produced in the ablation plume of solid boron and boron-nitride targets. The targets are ablated by a nanosecond pulsed laser at sub-atmospheric pressures of nitrogen and helium gases as well at pressure 100 mTorr. Optical emission spectroscopy is used to identify the excited species in the ablation plume. Evaluation of chemical composition in the plasma plume revealed that for both boron-rich targets, emission from BN molecules is always observed in nitrogen-rich environments. Presence of BN molecules also detected when ablating a boron nitride target in helium gas and at pressure of 100 mTorr. Furthermore, the ablation of BN target features emission of B_2N molecules, regardless of the pressure and surrounding gas. These results suggest that the ablation of the BN target is more favorable for the generation of complex molecules containing boron and nitrogen species and possibly hint that BN is also more favorable feedstock for high-yield BN nanomaterial synthesis. Plasma parameters such as electron temperature (peak value of 1.3 eV) and density (peak value of $2x10^{18}$ cm^{-3}) were also investigated in this work in order to discuss the chemical dynamics in the plume.

[1]The experiments were supported by the US DOE, Office of Science, Basic Energy Sciences, Materials Sciences and Engineering Division and by Office of Fusion Energy Sciences under contract number DE-AC02-09CH11466.

Shurik Yatom
Princeton University , Princeton Plasma Physics Lab

Date submitted: 23 Jun 2020 Electronic form version 1.4