Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Simulation of Carbon Production from Material Surfaces in Fusion Devices[1] J. MARIAN, L.A. ZEPEDA-RUIZ, G.H. GILMER, C. MUNDY, E.M. BRINGA, T. ROGNLIEN, Lawrence Livermore National Lab, J. VERBON-COEUR, UC Berkeley — Impurity production at carbon surfaces by plasma bombardment is a key issue for fusion devices as modest amounts can lead to excessive radiative power loss and/or hydrogenic D-T fuel dilution. Here results of molecular dynamics (MD) simulations of physical and chemical sputtering of hydrocarbons are presented for models of graphite and amorphous carbon, the latter formed by continuous D-T impingement in conditions that mimic fusion devices. The results represent more extensive simulations than we reported last year, including incident energies in the 30-300 eV range for a variety of incident angles that yield a number of different hydrocarbon molecules. The calculated low-energy yields clarify the uncertainty in the complex chemical sputtering rate since chemical bonding and hard-core repulsion are both included in the interatomic potential. Also modeled is hydrocarbon break-up by electron-impact collisions and transport near the surface. Finally, edge transport simulations illustrate the sensitivity of the edge plasma properties arising from moderate changes in the carbon content. The models will provide the impurity background for the TEMPEST kinetic edge code.

[1]Work was performed under the auspices of US DOE by University of California LLNL under contract No. W-7405-ENG-48 and was support by LDRD project 04-SI-003.

Thomas Rognlien
Lawrence Livermore National Lab

Date submitted: 22 Jul 2005 Electronic form version 1.4