Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Study of ND_3-enhanced MAR processes in D_2-N_2 plasmas to induce plasma detachment SHOTA ABE, SAIKAT CHAKRABORTY THAKUR, RUSS DOERNER, GEORGE TYNAN, Univ of California - San Diego — The Molecular Assisted Recombination (MAR) process is thought to be a main channel of volumetric recombination to induce the plasma detachment operation. Authors have focused on a new plasma recombination process supported by ammonia molecules, which will be formed by impurity seeding of N_2 for controlling divertor plasma temperature and heat loads in ITER. This ammonia-enhanced MAR process would occur throughout two steps. In this study, the first step of the new MAR process is investigated in low density plasmas ($N_e \approx 10^{16}$ m^{-3}, $T_e \approx 4$ eV) fueled by D_2 and N_2. Ion and neutral densities are measured by a calibrated Electrostatic Quadrupole Plasma (EQP) analyzer, combination of an ion energy analyzer and mass spectrometer. The EQP shows formation of ND_3 during discharges. Ion densities calculated by a rate equation model are compared with experimental results. We find that the model can reproduce the observed ion densities in the plasma. The model calculation shows that the dominant neutralization channel of D_x^+ (x=1-3) ions in the volume is the formation of ND_y^+ (y=3 or 4) throughout charge/D^+ exchange reactions with ND_3. Furthermore, high density plasmas ($N_e \approx 10^{16}$ m^{-3}) have been achieved to investigate electron-impact dissociative recombination processes of formed ND_y^+, which is the second step of this MAR process.

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Date submitted: 24 Aug 2017 Electronic form version 1.4