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Characteristics of Sheath and Presheath Recovery during Pulse Fall Time JAE-MYUNG CHOE, KYOUNG-JAE CHUNG, Y.S. HWANG, GON-HO KIM, Department of Energy Systems Engineering, Seoul National University — Recovery motion of sheath and presheath is investigated with various fall times of negative bias on the target. Experimental observation was carried out with the collisionless argon plasma and the various pulses with fast and slow fall times which are shorter and longer than the ion transition time scaled of $3/\omega_{pi}$(ω_{pi}=ion plasma frequency), respectively. Electrical probe was employed to measure the density distribution. Ion distribution and speed near the target are important factors in determining the position of sheath . For the slow fall time, sheath and presheath boundaries recover with the same speed. Child-Langmuir sheath continuously persists due to enough time to rearrange ions and electrons. For the fast fall time, ion matrix sheath, which is immediately responding to the target voltage, leads the recovery of sheath with supersonic speed. Presheath follows ion inertia that was formed at the plateau time and its speed does not follow the speed of the sheath. Voltage-responding electrons enhance the ion diffusion from the bulk plasma, resulting in the plasma filling in the depletion region. For the intermediate fall time ($\gtrsim 3/\omega_{pi}$), the transformation from ion matrix to Child-Langmuir sheath occurs after ion responds. Detailed results will be presented.

Jae-Myung Choe
Department of Energy Systems Engineering, Seoul National University

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