

Abstract Submitted  
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**Experimental and numerical studies of neutral gas depletion  
due to neutral gas collisional heating in an inductively coupled plasma**

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— The significant neutral gas temperature rise has been observed in various noble gases in the center of an inductively coupled plasma (ICP) chamber and the actual neutral gas pressure has been obtained by considering the thermal transpiration effects with this neutral gas increase. A plate which consists of 8 vertical optical ports with collimating lens and a movable optical fiber probe have been developed and used to measure axial and radial profile of gas temperature in an ICP respectively. When thermal transpiration is accounted for, our neutral pressure measurement shows the gas pressure remains the same as the fill pressure when plasma is on. Since the neutral gas presumably follows the ideal gas law,  $p=nT$ , our results therefore imply that the neutral gas density is significantly reduced in the central region of the discharge chamber. 0D/1D neutral gas heating model has been developed and compared with experimental results. DSMC (Direct Simulation Monte Carlo) has been carried out to simulate the ion acceleration in collisional pre-sheath and charge exchange/elastic collisions with background neutral gas.

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