

**ANOMALOUS DOPPLER BROADENING OF HYDROGEN  
LINES DUE TO EXCITATION BY FAST NEUTRALS IN  
LOW PRESSURE TOWNSEND DISCHARGES**

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For many years weak Doppler broadened wings were observed on hydrogen lines emitted from low pressure discharges. Explanations were usually related to dissociative processes or excitation by ions. Petrovic and Phelps were the first to perform the measurements in Townsend discharges and by observing the emission along the axis of the discharge two groups of fast particles were observed one going towards the cathode and away from the cathode. Current dependence ruled out excitation by electrons of the fast atoms produced in dissociative charge transfer collisions. Thus the results could only be explained by excitation by fast neutrals produced either in charge transfer collisions or by neutralization and reflection of ions at the surface. The energies of up to the total available energy (potential fall) were found, though the reflected component had typically 3 times smaller energy. Even more pronounced effects were found at lower E/N in mixtures of hydrogen and argon and methane and argon, though similar effects were observed with other light rare gases. These effects as found in Grimm discharges were studied in great detail by Konjevic and coworkers. In addition some implications for cold fusion were recently analyzed in the literature. we shall, however, discuss the implications of this process in plasma etching of integrated circuits.