The Child-Langmuir laws and cathode sheath in the N_2O VALERIY LISOVSKIY[1], EKATERINA ARTUSHENKO, VLADIMIR YEGORENKOV, Kharkov National University, Svobody Sq.4, Kharkov 61022, Ukraine — It is established which of the Child-Langmuir collisional laws are most appropriate for describing the cathode sheath in the N_2O. At low pressure $p < 0.3$ Torr the Child-Langmuir law version relating to the constant ion mobility. At $p > 0.75$ Torr one has to employ the law version for which it is assumed that ion mean free path within the cathode sheath is constant. In the intermediate pressure range $0.3 < p < 0.75$ Torr neither of the Child-Langmuir law versions gives a correct description of the cathode sheath in the N_2O. The ratio of the normal current density to the gas pressure squared J/p^2, the normal voltage drop and the cathode sheath thickness are determined. For the stainless steel cathode they equals to $U = 364$ V and $pd = 2.5$ Torr·mm. At large N_2O pressure the above ratio remains constant and it amounts to $J/p^2 = 0.44$ mA/(cm·Torr)^2 for any inter-electrode gap value we studied. On decreasing the N_2O pressure the ratio J/p^2 increases and for narrow gaps between electrodes it may approach several or even several tens mA/(cm·Torr)^2.

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