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**Applicability of the Child-Langmuir laws versions for describing the glow discharge cathode sheath in CO<sub>2</sub>** VALERIY LISOVSKIY, HENNADII KROL, RUSLAN OSMAYEV, VLADIMIR YEGORENKOV, Kharkov National University, 61022, Kharkov, Svobody Sq. 4, Ukraine — This work is devoted to the determination of the law that may be applicable to the description of the cathode sheath in CO<sub>2</sub>. To this end three versions of the Child-Langmuir law have been considered – a collision free one (for the ions moving through a cathode sheath without collisions with gas molecules) as well as two collision- related versions– one for a constant mean free path of positive ions and one for a constant mobility of positive ions. The current-voltage characteristics and the cathode sheath thickness of the glow discharge in carbon oxide have been simultaneously measured in the pressure range from 0.05 to 1 Torr and with the discharge current values up to 80 mA. The inter-electrode distance has been chosen such that the discharge consists only of the cathode sheath and a small portion of the negative glow, i.e. the experiments have been performed in short tubes. In this case the voltage drop across the cathode sheath is equal approximately to the voltage drop across the electrodes. In the whole range of the discharge conditions we have studied the cathode sheath characteristics are found to obey correctly only to the Child-Langmuir law version with a constant ion mobility. The reason for this phenomenon may be related with a significant conversion of carbon dioxide molecules.

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