THE DRIFT OF ELECTRONS IN A GAS IN A SPATIALLY INHOMOGENEOUS PERIODIC ELECTRIC FIELD

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In this paper we consider the electron drift in the electric field, which is a periodic disturbance of the power of character: $E(x)=E_0\{x/L\}^n/(n+1)$. Here L - period, {x} - the fractional part of x, {x} = x - [x], [x] - the integer part of x. At drift electrons acquire energy by Joule heating $Q_{EW}=eEW$, e - the electron charge, E - electric field, W - the drift velocity. The purchased energy is lost in elastic collisions with atoms, is spent on the excitation of atomic levels and ionization: $Q_{EW}=Q_{ea}+Q_{ex}+Q_{ion}$.

In Tab. the results of Monte Carlo simulations [1] electron drift characteristics in neon at a temperature of 298 K, given the average electric field E / N = 10 Td: drift velocity W, the average energy $<\varepsilon>$, percentage of energy input that went to the excitement **100%** Q_{ex}/Q_{EW} and ionization, , **100%** Q_{ion}/Q_{EW} . As a measure of heterogeneity of variance is shown δ^2 , normalized to the mean field: $\delta^2=\left[\langle E^2(x)\rangle-\langle E(x)\rangle^2\right]/\langle E^2(x)\rangle$

	Characteristics of the field		***Drift characteristics***			
No	***n***	δ^2	***W, km/s***	$<\varepsilon>$ **, eV**	Q_{ex}/Q_{EW} **, %**	Q_{ion}/Q_{EW} **,%**
1	***0***	***0***	***19.7***	***7.75***	***79.3***	***1.7***
2	***1***	***1/3***	***19.4***	***7.54***	***78.6***	***2.8***
5	***2***	***9/5***	***18.7***	***7.21***	***77.9***	***4.3***
7	***3***	***16/7***	***18.3***	***6.94***	***77.1***	***5.8***
9	***4***	***25/9***	***17.9***	***6.71***	***76.6***	***6.9***
11	***5***	***36/11***	***17.5***	***6.53***	***76.3***	***7.8***

A comparison of the distribution functions of the electron energy distributions Maxwell Druyvesteyn, and with the approach of an unlimited flow (pipe model) [2]. From the analysis of the results of calculations that:
- even the large spatial fluctuations of the field does not lead to a large change in the average characteristics of the drift of the drift velocity and average energy;
- the largest increase in the dispersion of the field effect has on the rate of ionization, there is a significant increase in the ionization rate and the proportion of the energy used for ionization;
- the spatial inhomogeneity of the field can lead to Maxwellization electrons in the glow Townsend discharge, which is the subject of a long-known and much-discussed paradox Langmuir [2].

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References

[1]. Golyatina R.I., Maiorov S.A., Applied Physics, 2011, №5, 22.
[2]. Cendin L., UFN, 2010, **133**, issue. 4, 948.