

SYSTEMATIC STUDY OF THE CHARACTERISTICS OF THE POINT-TO-PLANE CORONA ON NATURAL OBJECTS

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1. Introduction

High geoelectric field intensity resulting from different meteorological situation gives rise to corona discharges at the tops of trees. In ambient polluted air the dissociation of O_2 with consequential formation of ozone and other various products takes place in the neighbourhood of plants and trees. The aim of this paper is to investigate the basic properties of spontaneous forms of such corona discharges.

DC negative and positive coronas in the atmospheric air on living material have been studied. A series of experiments with different point electrodes, formed by the part of various plants, has been carried out in ambient air. Systematic variation of the macroscopic experimental parameters has yielded the functional dependence of the time-averaged corona current and pulse of both polarity frequencies on the applied voltage, radius of coronating electrode and point-to-plane spacing.

2. VA characteristics

The first part of this article is devoted to the measurement of the electric VA characteristics. The variation with geometry of the inception voltage and of the slope of the characteristics have been recorded and measured data have been compared with the predictions of the dimensional analysis. Some of the measured VA characteristics are shown on figures 2-4. For comparison can be seen on figure 1 VA characteristic of corona discharge on metal point electrode (brass). The experiments show that the basic character of corona discharge on living plant is the same as on the metal electrodes with small individual differences.

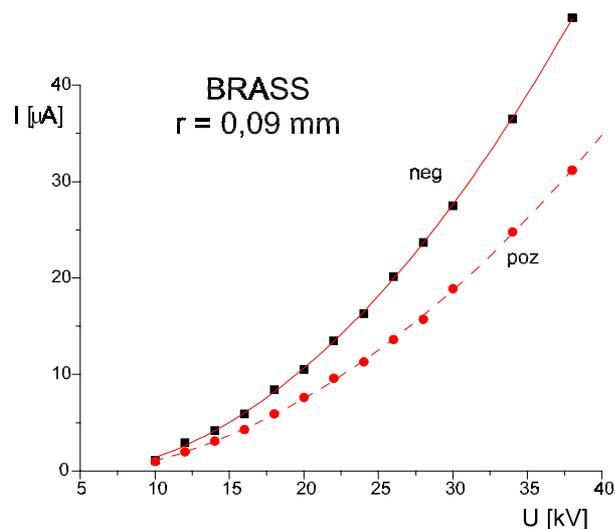


Fig. 1.

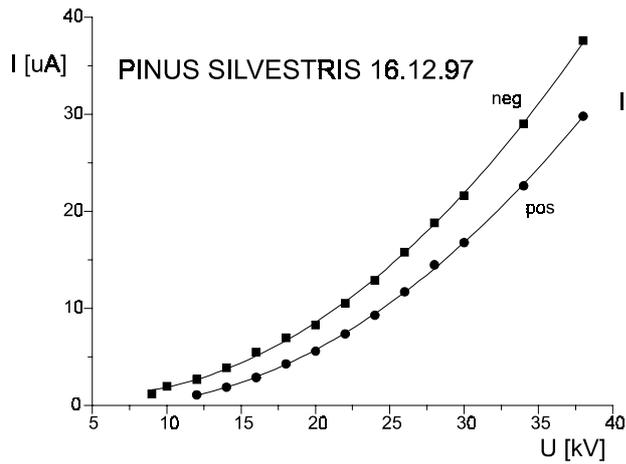


Fig. 2.

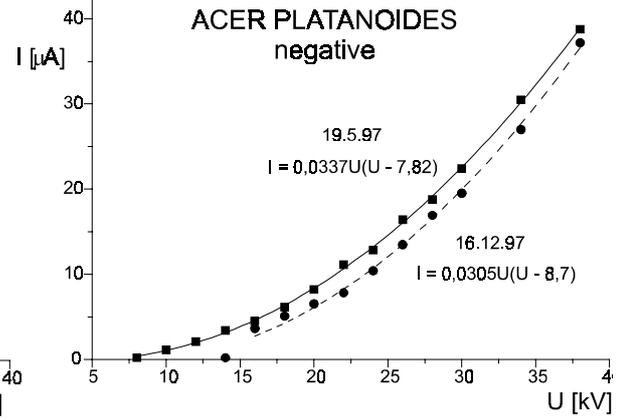


Fig. 3.

3. Pulses

The second part of this paper deals with the observation of the Trichel and streamer corona pulses in the same discharges. The pulses are shown in both polarities on figure 5 and 6. More differences compared with corona with metal electrodes have been found. The pulses are more irregular and have smaller amplitudes.

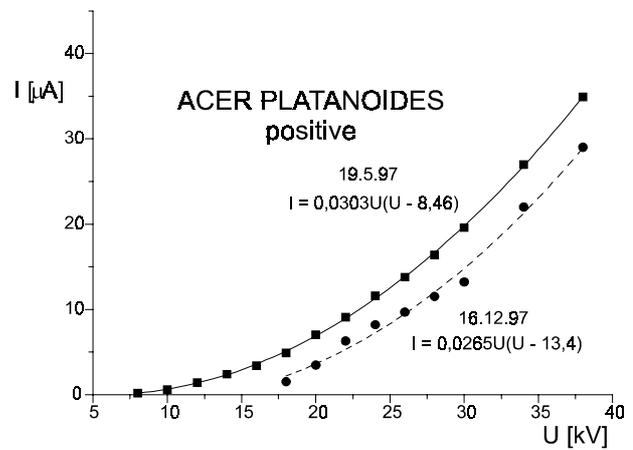


Fig. 4.

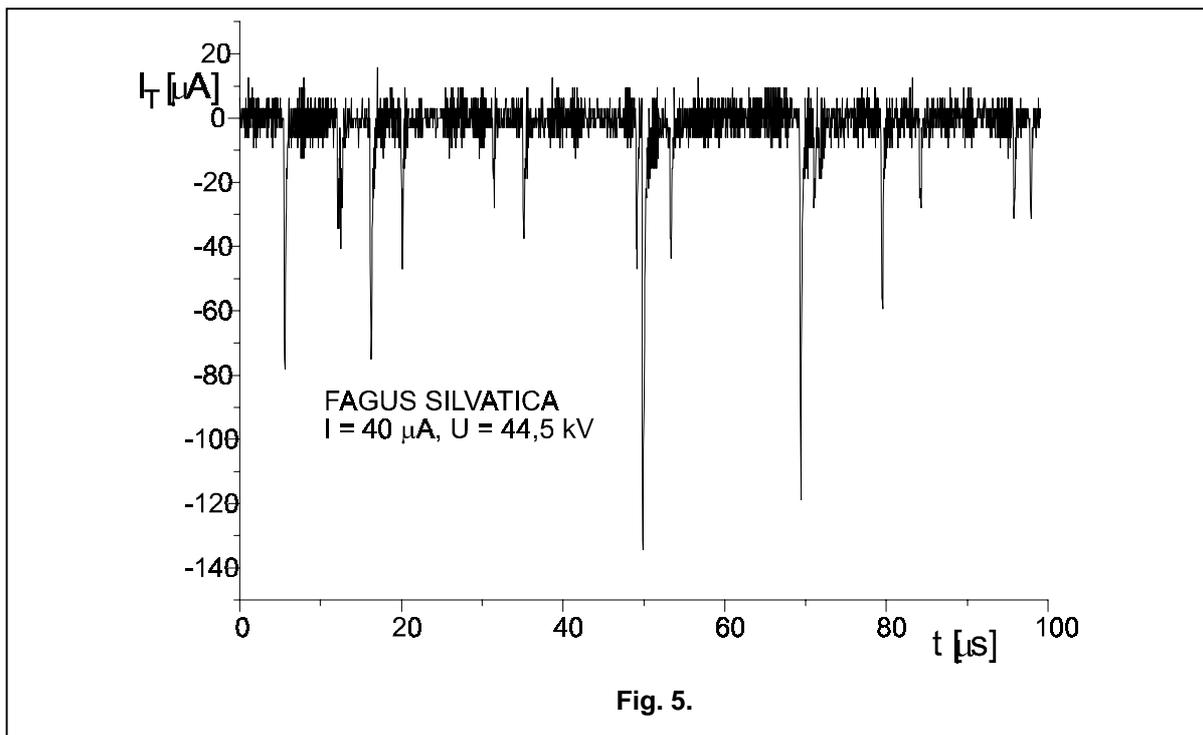
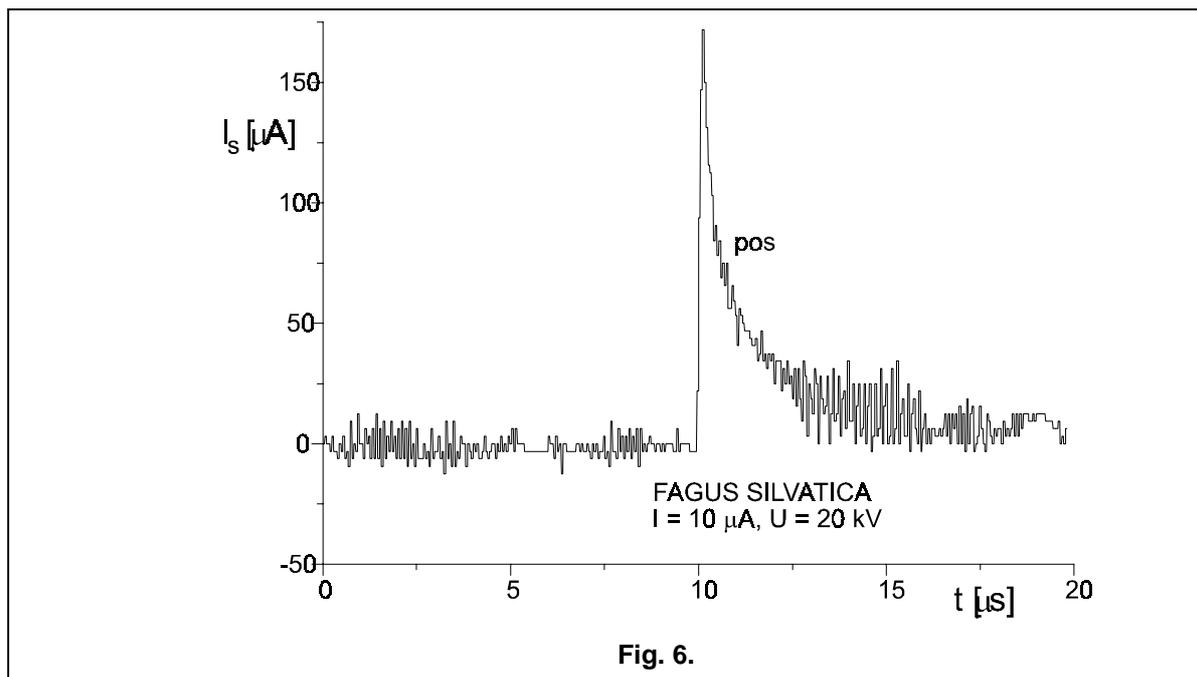
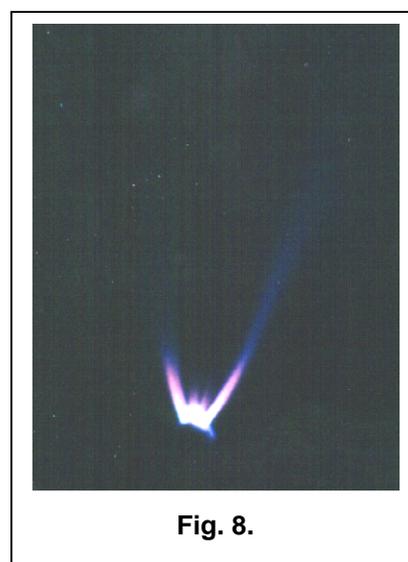
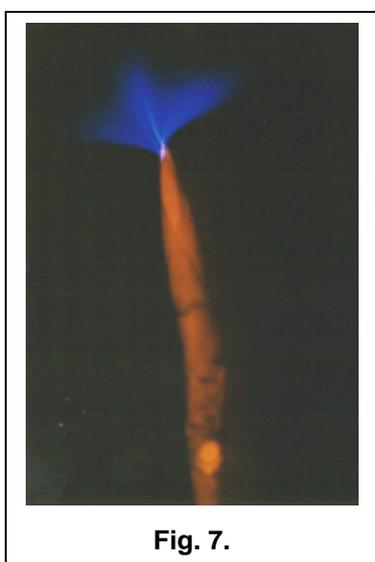


Fig. 5.



4. Conclusion

The presented contribution is accompanied by the unpublished unique photographs of the corona discharge on several living plants - buds of the beech (Fig. 7) and pine needle leaves (Fig. 8).



References

- [1] Bednář J.: Podivuhodné jevy v atmosféře. Academia, Praha, 1989.
- [2] Hosokawa T., Kondo Y., Miyoshi, Y.: "Prebreakdown Phenomena of Negative Point-to-Plane Air Gap", Electrical Engineering in Japan **89** (9), 120, 1969.