Influence of streamer properties on the chemical efficiency of pulsed corona applications.

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In addition to being interesting phenomena to study, discharges and streamers can also be used for several purposes. Gas cleaning techniques using non-thermal plasma are slowly introduced into industry nowadays, as a replacement for existing gas cleaning techniques. For large scale, industrial, application of non-thermal plasma, several challenges arise, like increasing the scale, safety, long life-time, costs reduction, and so on. In the past we already demonstrated the possibility to design large scale (10-20 kW average power) pulsed corona plasma systems [1, 2]. By optimizing the matching between source and reactor, the electrical energy efficiency (from mains to reactor) was increased to over 90 percent [1, 2].

To decrease the operation cost of the system even further, the chemical efficiency has to be increased as well, i.e. ensure that the available energy is used for the desired chemical reactions. Several authors have already observed that, by changing the characteristics of the power source, the chemical efficiency of the system changes. The link between power source and chemical process is formed by the streamer plasma.

During our study we use nanosecond pulsed corona system. We want to investigate the influence of changes in pulse parameters (Table 1) on the chemical efficiency of the process. The changes in plasma generation will be monitored with a fast (5 ns gate-time) ICCD camera. At first, ozone generation will be studied. In a later stage, tar removal from bio-gas will become the chemical process under investigation.

At this moment the ICCD camera is being installed, the rest of the experimental set-up is finished. If available, the first pictures of the streamer plasma will be presented during the workshop.

Table 1: Ranges for pulse parameter variation

Parameter	*Range*
Pulse width	50-200 ns
Rise-time	5-100 ns
Peak voltage	0-60 kV
Energy per pulse	0-5 J

[1] K. Yan, "Corona Plasma Generation", Ph. D. thesis, Eindhoven University of Technology, 2001

[2] G.J.J.Winands, K.Yan, S.A. Nair, A.J.M. Pemen, E.J.M. van Heesch, Plasma Processes and Polymers, Vol. 2, No. 3, 2005, pp. 232-237.