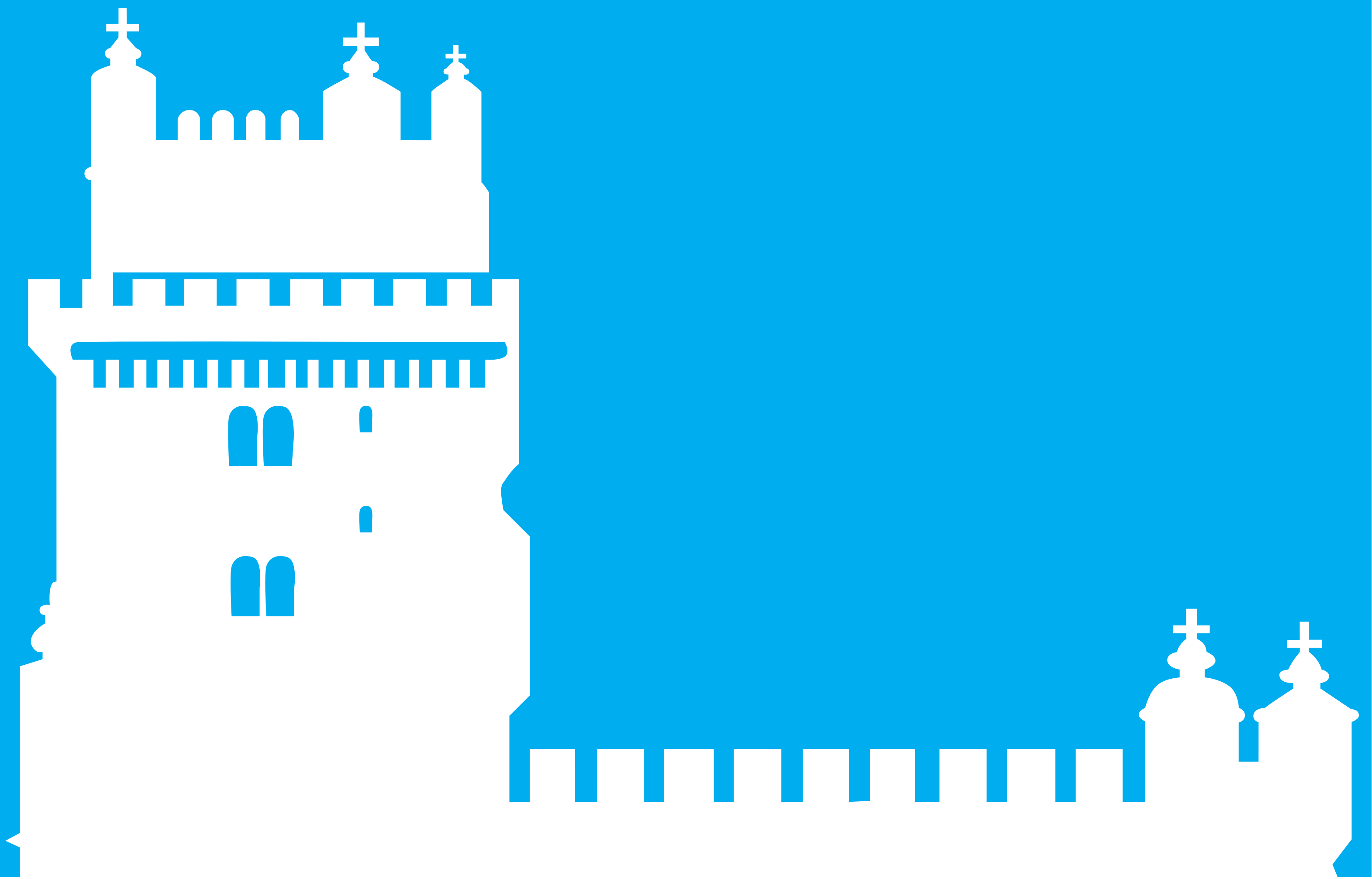
# ICPIG 2017

## XXXIII INTERNATIONAL CONFERENCE ON PHENOMENA IN IONIZED GASES

### CONFERENCE PROCEEDINGS



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The XXXIIII ICPIG (International Conference on Phenomena in Ionized Gases) has been organized by Instituto de Plasmas e Fusão Nuclear from Instituto Superior Técnico, Universidade de Lisboa, Universidade do Porto and Universidade do Minho.

The XXXIII ICPIG was organized in accordance with IUPAP principles, regarding the free circulation of scientists for international collaborations and discussions, as stated in the declaration of the International Council of Science, adopted at the 26th General Assembly in 2008 and endorsed by the 27th General Assembly in 2011. In particular, no *bona fide* scientist is excluded from participation on grounds of origin, nationality or political considerations unrelated to science.

Topic number
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# Atmospheric pressure plasmas for agriculture, medicine and surface technology

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An atmospheric pressure plasma jet and glidarc reactors were used to enhance the seed germination, disinfect non-heat resistant surfaces and to increase wettability of selected polymeric materials. Selected reactive oxygen and nitrogen species (RONS) were measured for plasma generators operating in different modes: Transient Spark, Mini Glide-arc and Dielectric Barrier Discharge Jet to find optimal operational conditions for selected biomedical and agricultural applications. E. coli was selected as a model microorganism for biodecontamination comparative tests.

## 1. Introduction and experimental set-up

Different types of discharges could be taken into account for biomedical, material and agricultural applications. This work summarizes selected experimental results in above fields, obtained with Mini Glide-arc (GA), Dielectric Barrier Discharge Jet (BDB), radio frequency (RF) plasma jet and Transient Spark (TS) [1-4].

## 2. Results and conclusions

Paper is primary choice for antibiotic sensitivity tests (disc diffusion method). Radio frequency plasma jet with central electrode inside the nozzle, working with mixtures of oxygen, nitrogen, air with helium or argon was tested to decrease the surface contact angle of cellulose based paper platform using Kruss DSA25E goniometer. The highest change: decrease of surface contact angle from $96^o$ to $22^o$ after 60 s treatment was observed using mixture of helium and nitrogen. Experiments confirmed significant influence of the distance between the treated sample and reactor nozzle, especially for treatment times larger than 15 s.

After 30s application of DBD plasma jet working with helium gas and admixture of air caused average decrease of the contact angle for acrylonitrile-butadiene-styrene from $75^o$ to $42^o$, for polypropylene homopolymer from $82^o$ to $45^o$, and for high impact polystyrene from $90^o$ to $48^o$ o, respectively.

GA reactor was used for pre-sowing stimulation of *Lavatera thuringiaca* L. seeds. Five groups of seeds characterized by a different exposition times (1, 2, 5, 10 and 15 minutes) as well as untreated control were used. The highest germination parameters were obtained for seeds stimulated with plasma for the exposition times of 2 and 5 min.

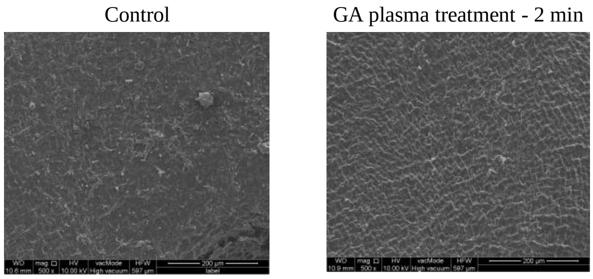


Fig. 1. SEM photos GA plasma treated seeds of *Lavatera thuringiaca* L., zoom 500x.

Germination capacity reached 60% and germination energy was 54.5% comparing to 36.25% and 30% for control, respectively. SEM photos (Fig. 1) indicated visible changes of the seeds' surface, however, distinguishing changes in the water contact angle measurement on the surface of the seeds were not observed. Measurements of RONS were performed in gas and liquid phase for selected plasma generators operating in different modes

## 3. References

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