

Plasmas in Liquids

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Plasmas produced by creating electrical discharges in liquids have long been the subject of scientific investigations but the last ten years or so have seen an enormous increased interest in their study. This has been prompted by their expanding range of applications. Here, after an introduction, the focus will be on an investigation [1] of plasma ignition in saline solution using electrical and imaging diagnostics, along with simulations, to investigate the behaviour of the discharges created. The saline contains grounded and needle electrodes. As the voltage applied to the needle in the saline solution is increased, and prior to the observation of visible discharges, different regimes for the boiling of the saline solution are observed. As the electric field strengths are increased within the vapour region light emission from that region is observed. A shadowgraphy method is used to explore the initial vapour layer phase. Finite element method (FEM) based simulations are used to estimate the electric field strengths. Particle image velocimetry (PIV) measurements give us information of the velocities achieved in the liquid due to the plasma formation. Fast framing cameras, spectrometers and ICCD cameras are also used. Any figures will be reproduced in black and white so please take that into account when producing.

Aspects of the chemistry of these water vapour plasmas, where Zoran Petrovic has made very significant contributions to the data base, will also be discussed.

References

- [1] L Asimakoulas, T A Field, L Dostal, F Krcma, and W G Graham *Plasma Sources Sci. Technol.* to be published.
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- [3] D.Marić, N.Škoro, P.D.Maguire, C.M.O.Mahony, G.Malović and Z. Lj. Petrović, *Plasma Sources Sci. Technol.*, **21**, (2012), 035016.
- [4] P.J. Bruggeman, Z.Lj. Petrovic *et al*, *Plasma Sources Sci. Technol.* **26**, (2016), 053002.