Microsparks Generated by Charged Particles in Dielectric Liquids

ROBERT GEIGER, Texas A&M University, DAVID STAACK TEAM — The electrodynamics of charged particles in dielectric liquids have been described by several authors [1,2]. As a charged particle approaches an electrode of opposite charge the local electric field eventually exceeds the dielectric strength of the liquid and a microspark is generated. These plasmas can be very small, about $\mu m$, and may exhibit non-thermal behavior. Such non-thermal behavior can provide interesting and efficient chemical reactions [3]. An understanding of the plasma properties for this type of discharge can provide a simple means of generating non-thermal plasmas in dielectric liquids, such as oils or other hydrocarbons, which can be used to chemically process the liquids. Such a technology may lead to a highly efficient method of heavy oil upgrading which can be easily scaled. In order to understand the plasma properties optical emission spectroscopy is carried out for various hydrocarbons and voltage-current characteristics are used to determine the energy cost for this process.