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Plasma kinetics for plasma medicine applications in cancer treatment

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The possibility of generating low temperature non-thermal equilibrium atmospheric pressure plasmas in contact with liquid has led to a large number of biological and medical applications such as cancer treatment through plasma-induced apoptosis, dermatological applications, and wound healing. The major plasma reactive species mainly rely on the plasma temperature. Gas temperature can vary rapidly in the presence of liquids therefore, gas temperature is a vital factor which impacts the determination of the technological application of each type of plasma. Plasma activated microdroplets has a great importance in developing cancer treatment therapy, however, microdroplets significantly affects the gas temperature so it requires more control especially for biomedical applications that needs heat control such as skin cancer treatment. This project aims at studying the chemical kinetics of low-temperature atmospheric pressure plasma. My initial focus is on measuring and controlling gas temperature measurements in the presence of microdroplets using infrared temperature sensor (IR) that provides instant and accurate measurements (my recent published paper). Then studying the chemical analysis of plasma exposed microdroplet surfaces. This study also will include monitoring the effect of low energy electrons (LEE) generated by the plasma on the damage of DNA cancer cells and the possibility of delivering activated microdroplets inside the human body for effective cancer treatment.

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