ABSTRACT

The great need to sterilize biologically sensitive or sterile material in operating theatres, has been given great importance for years. Among the various decontamination techniques being studied, there is a relatively new technique that involves using plasma for the process of decontaminating and sterilizing operating theatres.

Plasma is known as the fourth State of matter, and holds the properties of free electrons, ions and cations, as well as other reactive species. This makes it a good candidate for the sterilization and/or decontamination of biological material.

Nowadays, the use of plasma is being used with equipment that serves in the process of decontamination. Yet, this equipment at present, is working with low pressure and small volumes, based on the configuration of the electrodes. Generally, noble gases or peroxide are used to produce plasma, which makes it very difficult to use in the field.

This thesis requires atmospheric pressure and non-thermal plasma generation equipment. In particular, a system called Atmospheric Pressure Plasma Chamber - No Thermal Plasma (APPC-NTP) and another system called Atmospheric-Pressure Plasma Jet - No Thermal Plasma (APPJ-NTP), which are based on two different systems.

Both systems are characterized by the use of pure air as gas for the production of plasma. They work at atmospheric pressure and produce plasma at room temperature, which makes them perfect candidates to be used cost-effectively in many situations, even in the field, and can be used in the decontamination of sensitive material.

The objective of this thesis is to investigate and establish a correlation if any, between independent variables entering the system, and dependent variables, or output of the system. This, in order to understand the behaviour of the plasma generated in the conditions, explained in the previous paragraph.

While it is true that there are two different systems, the APPC-NTP and APPJ-NTP, the first has been divided into two, during the development of this thesis. Because two completely different voltage amplifiers have been used, the variables which have been studied, both input and output, have given different results.

In conclusion, the work which has been done for this thesis, has established the correlation between the variables of entry and exit. Thus, leaving open the possibility of studying the behaviour of these, in relation to the efficiency of biological decontamination or sterilization.