KN0300

# Low pressure plasma discharges etching mechanisms of organic and biological materials

Ondrej Kylian[1], Francesco Fumagalli[2], Francois Rossi[2]

[1]Charles University in Prague, Prague, Czech Republic [2]European Commission, JRC, Ispra (VA), Italy

kylian@seznam.cz

Recent studies revealed that many of medical instruments, tools, accessories or devices processed by common cleaning, sterilisation and decontamination procedures exhibit high level of soiling by residual biological matters, which in turn represents serious risk of onset of nosocomial infections, inflammations or iatrogenic transmission of severe diseases. The high level of biological contamination is given mainly by high resistance of certain biological pathogens towards chemical or physical treatment. Therefore alternative sterilization/decontamination procedures are urgently needed and application of low pressure plasma discharges is one of promising candidates.
In general, two strategies may be followed: i) inactivation of pathogens without necessity to remove them physically from the surface or ii) physico-chemical removal of biological matter from surfaces. In this contribution the second possibility is going to be introduced and discussed on selected examples including bacterial spores, bacterial endotoxins, proteins or amino acids treated using low pressure inductively coupled plasma. The main attention will be devoted to the identification of the key processes leading to the removal of organic and biological materials from surfaces. In order to reach this general goal, changes of morphology and chemical structure of biological samples induced by plasma treatment were compared with properties of plasma discharges determined by plasma diagnostics techniques. Based on this comparison, process of chemical sputtering combining effects of energetic ions and chemically active radicals produced in the plasma discharge is suggested as the dominant mechanism leading to removal of organic and biological materials from surfaces. In addition, possibility to optimize plasma treatment using either ternary gas mixtures or water vapor plasma will be introduced alongside with the discussion of limitations of plasma treatment for sterilization and/or decontamination of surfaces used in the medical praxis.

**Keywords**
etching
sterilization
ICP plasma