Control of biocidal properties conferred to polymers by dry ozone exposure for achieving inactivation of B. atropaheus spores

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Surfaces of materials can be modified to ensure specific interaction features with microorganisms. Polymeric surfaces subjected to dry gaseous ozone acquire the ability to inactivate microorganisms, including those as resistant as bacterial spores [1]. However, the inactivation efficacy level depends strongly on the type of polymer considered: for instance, polymers such as silicone, polyurethane and polystyrene provide high inactivation rates, while polypropylene and polymethylmethacrylate are particularly inefficient; polyethylene and Teflon show no biocidal activity at all [2]. The originality and advantages of this ozone treatment of polymer surfaces rest on its simplicity (achieved at ambient temperature and pressure, a one step process) and its efficacy.

We present preliminary results concerning the effect of ageing of polystyrene substrates pre-exposed to dry gaseous ozone upon inactivation of bacterial spores: the inactivation efficacy level decreases as the age of the pre-exposed polystyrene surface increases. The surface modification of polystyrene surfaces expose to dry gaseous ozone is monitored by measurement of contact angle with water. At $t=0$ min, the contact angle of the polystyrene surface is 63°. After 1 h exposure to the treatment (4000 ppm ozone concentration), the contact angle of the Petri dish surface falls from 63° to 12°: the surface has become much more hydrophilic. Furthermore, the contact angle value remains constant as a function of time after ozone exposure.