Development of a Decontamination Method for Degradation of Platinum Complexes Utilizing Vapor Phase Hydrogen Peroxide

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Introduction: Vapor phase hydrogen peroxide (VPHP) process is a modern decontamination method utilizing vapor phase hydrogen peroxide as an effective agent. So far, it has been used for bio-decontamination such US postal service buildings remediation after anthrax terrorist attacks in 2001, medical tools or areas sterilization or in food industry. Intensive research of its possible use for degradation of environmental polluting chemical contaminants (pesticides, industrial poisons, etc.) chemical weapons and especially biological active compounds like drugs, hormones and so on, is now performed. This work is aimed to study the decontamination process utilizing VPHP as an effective agent for the degradation of biologically active platinum complex compounds.

Aims: The aim of this work is to examine the influence of humidity and VPHP concentration on the kinetics of the degradation of a platinum complex model compound (potassium trichloroammineplatinate, TCAP).

Methods: The experiments were performed in the sophisticated laboratory experimental device called “peroxybox” especially developed for these purposes. It allows setting up various reaction conditions such as temperature, relative humidity and VPHP concentration. The samples of model substance deposited on microscope quartz slides were exposed to the set degradation conditions and then withdrawn in specific time intervals. The samples were evaluated using a new developed HPLC method.

Results: It is evident that VPHP is an applicable method for the degradation of platinum complexes. The relative humidity was proven to be a very important parameter for the degradation efficiency. The wet process is more efficient and about 1.3 times faster than the dry process. The minimal effective VPHP concentration was found to be 400 ppm for the dry process and 200 ppm for the wet process. Complete TCAP degradation was achieved in less than 1 and 2 h during the wet process and dry process, respectively, perfectly fulfilling the demands for practical usage.

Conclusion: Results show a good presumption for future studies and possible use of the VPHP method for the degradation of platinum cytostatics.

Keywords: VPHP, decontamination, TCAP, platinum cytostatics, hydrogen peroxide.

References: