

SYNERGISTIC EFFECTS OF COMBINED MICROWAVE AND ELECTRON BEAM IRRADIATION APPLIED TO WASTE DECONTAMINATION

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A new method based on combined accelerated electron beam (EB) and microwave (MW) for biological waste processing is described. Comparative results obtained by using separate and combined EB and MW on microorganisms inactivation in natural products such as minced beef (Fig. 1), wheat bran (Fig. 2), wheat flour and sewage sludge are presented. A small-pilot installation was built for the comparative studies of waste biological decontamination using separate and combined EB and MW irradiation. It consists mainly of an EB source (ALID-7 linear accelerator of 5.5 MeV, built in our institute), a MW source of 2.45GHz, a multimode rectangular cavity in which are injected both EB and MW and a conveyor. A simultaneous irradiation with EB and MW resulted in the highest microorganisms inactivation, followed by a successive irradiation with MW and EB (MW and then EB), successive irradiation with EB and MW (EB and then MW), EB irradiation only and finally MW irradiation only. The goal of this work was to combine the advantages of both, EB and MW, for the waste microbiological decontamination, i.e. the EB high efficiency and MW volumetric heating and high selectivity in order to assure higher material microbiological safety, to extend the kind range of microorganisms to be inactivated, to reduce the required EB absorbed dose level and irradiation time. The upper limit of EB absorbed dose, which ensures a good decontamination effect, is reduced by a factor of at least of two by EB+MW irradiation.

