PRESERVATION OF PHOTOGRAPHIC AND CINEMATOGRAPHIC FILMS BY ELECTRON-BEAM IRRADIATION

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Abstract

The Nuclear and Energy Research Institute – IPEN through the Multipurpose Gamma Irradiation Facility and the Electron Beam Irradiation Facilities has disinfected several tangible cultural collections from the University of São Paulo – USP. Brazilian weather conditions added to the actions of insects and fungi promote biodegradation especially in cellulose based materials. In this sense, ionizing radiation is an excellent alternative to the traditional preservation process mainly because the biocidal action. Electron beam irradiation also presents new possibilities for processing materials with greater speed, despite having limited penetration. Adequate storage of photographic and cinematographic materials is a challenge for experts from preservation institutions. Contamination by fungi is one of leading causes of problem in this kind of collections. In addition, another common physicochemical degradation affecting cellulose triacetate films causing deacetylation of polymer chain is called “vinegar syndrome”. In this work are presented results of the effect of the electron beam irradiation on photographic and cinematographic films using an electron beam accelerator with energy of 1.5 MeV and beam power of 37.5 kW. Selected film samples were characterized by FTIR-ATR spectroscopy and FEGSEM-EDS microscopy. Samples were irradiated with absorbed dose between 2 kGy and 200 kGy. Irradiated samples were analyzed by UV-Vis spectrophotometry, FEGSEM, thermogravimetric analysis (TG) and differential scanning calorimetry (DSC). Results showed that disinfection by electron beam radiation can be achieved safely applying radiation absorbed doses between 6 kGy to 10 kGy with no significant change or modification of main properties of the constitutive polymeric materials. Electron beam irradiation, due to the effect of crosslinking is presented as an alternative to treat films affected by “vinegar syndrome” applying absorbed dose of 80 kGy in order to increase shelf life of cultural heritage materials.

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