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Ionizing radiation for the preservation and conservation of photographic and cinematographic films

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Abstract

The Nuclear and Energy research Institute – IPEN-CNEN/SP through the Multipurpose Gamma Irradiation Facility has treated several bibliographical collections of Sao Paulo University-USP for disinfection and disinfection of contaminated materials with insects and fungi. In this sense, gamma radiation from cobalt-60 is an excellent alternative tool to the traditional preservation process mainly because the biocidal action. Disinfection using gamma radiation for cultural heritage materials has been widely applied around the world in the last decades. Adequate storage of photographic and cinematographic materials is a challenge for conservation 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 effect of ionizing radiation on photographic and cinematographic films. Selected films were characterized by FTIR-ATR spectroscopy and FEGSEM-EDS microscopy. Samples were irradiated by gamma rays 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 gamma rays can be achieved safely applying radiation absorbed doses between 6 kGy and 10 kGy with no change or modification of main properties of the constitutive polymeric materials. Gamma rays due to the effect of crosslinking is presented as an alternative to treat films affected by “vinegar syndrome” applying absorbed dose of 50 kGy in order to increase shelf life of cultural heritage materials.