

# Radiosterilization of paper-based documents: the potential effects of gamma radiation on printing inks

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**Keywords:** gamma radiation, paper, ink.

This report presents a study of the contribution of gamma radiation on printing inks degradation. The work was performed as part of a Master's Degree dissertation in Nuclear Science and Technology in view of the development of a safe method of disinfection and treatment of paper samples. The chromaticity measurement was done using a "mask" of 37 mm x 105 mm in black A4 paper, where the samples submitted to gamma irradiation, accelerated dry aging and the combination of both treatments were individually positioned. This configuration aimed to establish a standard measure in all histograms avoiding the possibility of interference by the equipment due to lamp luminosity variations. The images were converted into histograms with Image J software, version IJ 1.46r as shown in Figure 1.

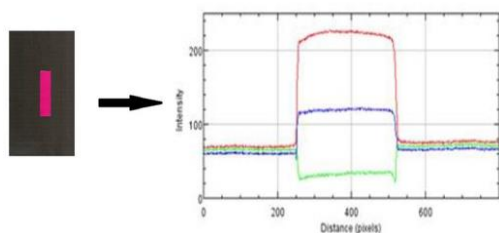


Figure 1. Composition of the magenta sample (irradiated at 10 kGy) with its following histogram

In Figure 2 the digital data was opened with Peak Fit software, version 4.11, in order to read and quantify each band in two distinct sectors: from 50 to 150 pixels establishing the control mean value in each image; and from 350 to 450 pixels, which is the sector of interest in the analysis of contrast. The ordinate varies from 0 to 255, and shows the intensity of the contrast in each band. The abscissa shows the quantity of pixels in each image.

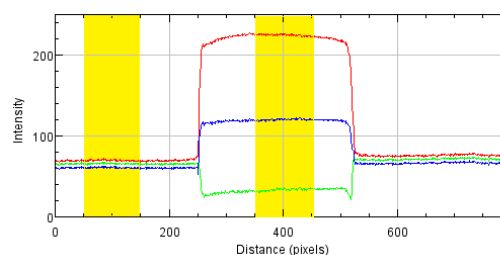


Figure 2. Chromaticity measurements

To determine if there is a significant difference between the results of chromaticity in the samples submitted to accelerated dry aging and not submitted to accelerated dry aging, the linear regression equation of each band was obtained as a composition of histograms of samples submitted to zero, 0.5, 2.0, 5.0 10.0 and 15.0 kGy. The ordinate varies with the intensity of the relative contrast in each band, and the abscissa varies with the total dose (in kGy) to which the sample was submitted [1].

From the results obtained it can be seen that gamma irradiation alone does not result in color alteration of all the samples tested. The results also suggest that accelerated dry aging caused severe alterations in contrast [2]. This alteration indicates the presence of chromophores in cellulose absorbing in the highest portion of the visual specter and, thus, giving the characteristic yellowish color of aged samples [3].

Improvements could be developed in new projects of studies in conservation through the research of the safe total dose for other types of inks such as plant dyes and animal based inks.

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