SOURCES OF ERRORS IN PERSONNEL FILM DOSIMETRY

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ABSTRACT

Minimising the errors in personnel dosimetry is an important task for the operators of individual dosimetry systems. To minimise the errors, one has to know the sources of errors and the magnitude of the errors. The present paper presents deal with the errors occurring in the film dosimetry of photon radiation in the range of 20 mR to 25 R. The dependence of the error of the measurement as a function of the dose, for high sensitivity film dosimeters was determined. Several sources of errors were analysed: the energy dependence of the emulsion, the errors as a function of dose, reproducibility of the developing procedure, angular dependence of the response, etc.

INTRODUCTION

Any situation involving the work with sources of ionising radiation requires the knowledge of the doses delivered to the occupationally exposed personnel. This requirement is fulfilled by monitoring the workers with individual radiation monitors (personnel dosimeters). Thus, the primary function of individual monitoring is to provide information on the exposure of individuals to ionizing radiation, to make sure that exposure limits are not exceeded and to support measures for reduction of exposures far bellow these limits, within an optimisation process.

To obtain relevant information it is necessary to know the precision of the measurements. The present papers highlights some of the sources of errors in personnel film-dosimetry and the evaluation of those errors.

METHOD AND MATERIALS

The film dosemeters used for all the experiments described below was AGFA Personal Monitoring films, in PTW cassettes. Each AGFA film dosemeter consisted from two films with different sensitivities (one for low doses, one for high doses) packed together. The dosemeters were from the same batch, and were separated in three groups, corresponding to the three experiments performed.

The energy dependence was determined by irradiating the dosemeters at the same dose, with X rays with effective energy between 30 keV and 120 keV and with a ^{137}Cs source (665 keV). To determine the error as a function of dose we have irradiated the dosemeters with ISO High X rays, 100 kVp, at doses ranging from 150 μGy to 233 mGy.

The angular dependence of the dosimeters was determined by irradiating the dosemeters at various angles between 0° and 360° for horizontal rotation and between 0° and 180° for vertical rotation. The radiation used was ISO High X rays, 100 kVp.