B3 FILM DOSIMETERS

Technical and Usage Information

B3 Film dosimeter products are the cornerstone of the WINdose dosimetry system. Each film dosimeter is manufactured under strict quality standards to ensure consistency and reliability. Below are some technical details and recommendations for successful use of the product. Contact GEX for additional information.

Usage:

Application: Applies to all products manufactured with B3 Film including *B3WINdose*™ and *B3DoseStix* radiochromic film products.

Wavelength and Measurement Readout Instructions: B3 dosimeters have historically been measured at 554nm over the entire range of use. The absorbance wavelength peak has more recently been approximated to be 552 nm. Because of the broad peak of the B3 film, measurement at any fixed wavelength between 550 – 555nm is considered acceptable. Alternatively the film can be scanned over the peak area and an average mean or median value can be obtained and used successfully. Dosimeters should be measured using a GEX manufactured dosimeter holder or equivalent.

B3 film thickness: GEX B3 dosimeters are manufactured in large, highly uniform batches that allow users to apply an average dosimeter thickness in the measurement process. A specified average thickness and variability is measured, assigned and printed on each box of GEX B3 dosimeters.

Dose rate effects: There are no known dose rate affects.

Irradiation Temperature Caution: Use of B3 Film products in irradiation temperatures above 60°C are at the user's discretion.

Pre-Irradiation Storage: GEX provides irreversible thermal labels to monitor maximum temperature on all B3 film shipments. Report any recorded temperatures of 45°C or higher directly to GEX so that appropriate actions can be determined. Store unopened packages under ambient conditions (15°C to 30°C). The packaging of B3 dosimeters is designed to provide an environmentally stable condition for the dosimeters for 10 years when stored under the above conditions for WINdose dosimeter packages and 3 years for its DoseStix dosimeter packages, though stated shelf life may be less (refer to the Certificate of Compliance which accompanies each shipment).

Environmental Conditions: The response function of radiochromic film dosimeters is affected by the temperature and the water content in the film material at the time of irradiation. B3 dosimeter products are typically supplied in sealed pouches to maintain the specific controlled environment in which they were packaged and sealed. Barcoded B3 dosimeter packages should remain sealed until after exposure. Non-barcoded B3 dosimeter packages should remain sealed until immediately before the time of exposure.

UV Exposure: The B3 radiochromic film is sensitive to UV radiation. Therefore, control exposure of unprotected film dosimeters to daylight and fluorescent light sources.

Calibration: Calibrate under conditions approximating actual usage. This should include time and temperature conditions that approximate actual process conditions. For guidance, see: ISO/ASTM 51261 and NPL Report CIRM 29.

- ***Usable Calibration Range*:** 1.0 kGy - 140 kGy or as determined by user's application and uncertainty requirements. Using multiple replicate packaged dosimeters or calibrating multiple dose ranges can result in significant reductions in expanded uncertainty.

- ***Recommendation:*** GEX recommends using an in-situ calibration method designed to capture routine process conditions whenever possible. Use an appropriate calibration phantom or equivalent (as described in ISO/ASTM 51261 and NPL CIRM Report 29) to co-locate the transfer standard dosimeters in controlled proximity to the routine dosimeters being calibrated taking care to maintain a repeatable geometry with equilibrium conditions (see references).

The dosimeter batch calibration should be accomplished under normal process (including temperature) conditions. Dosimeters should be read at a time interval(s) consistent with routine production dosimetry. This may include readings at multiple time intervals, which are analyzed to determine the specifics of the color development cycle and to establish a correction factor for color development if necessary.

Post Irradiation Stability: The coloration of B3 radiochromic film material may continue to develop for some period of time after irradiation, causing the measured response values to change. To eliminate dosimeter response variance, post irradiation heat treatment of B3 film dosimeters can be used to complete the color development cycle and render B3 dosimeters 100% post irradiation stable. Dosimeters that have been properly heat treated will remain stable for more than a year.

Therefore, for optimum performance, GEX recommends a post-irradiation heat treatment process be used for all B3 dosimeter products. The user should validate the heat treatment method used. For current recommendations and information regarding special heat treatment equipment designed specifically for *B3WINdose*™ and *B3DoseStix* dosimeters, visit our website, www.gexcorp.com, or contact GEX directly.

Static and Radiochromic Film Surface: Static conditions may cause particulate to be drawn to the dosimeter surface that can cause readout error. Remove visible particulate with a soft brush or piece of soft anti-static cloth.

Dosimeter Identifications: A batch ID and unique dosimeter identification number is found on each *B3WINdose*™ and *B3DoseStix* dosimeter. This provides users with absolute dosimeter verification information. Dosimeter thickness information may be found on the product box.

Barcoded Dosimeter Packages: Some *B3WINdose*™ and all *B3DoseStix* packages contain barcodes that can be used to provide automated data entry of the unique dosimeter ID numbers directly to computer based data tracking and dosimetry software systems. The *B3DoseStix* barcodes can be read through the packaging window.

References:

1) "A New Radiochromic Thin Film Dosimeter System", A. Miller et al, Radiation Physics and Chemistry Volume 31 pp. 491-496, 1988 International Journal Radiation Applications and Instrumentation, Part C. Printed in Great Britain.

2) ISO/ASTM Standard Practice 51275 - Standard Practice for Use of a Radiochromic Film Dosimetry System.

3) ISO/ASTM Standard Guide 51261 - Standard Guide for Selection and Calibration of Dosimetry Systems for Radiation Processing. NPL Report CIRM 29; Guidelines for the Calibration of Dosimeters for Use in Radiation Processing.

4) "Temperature, Humidity and Time. Combined Effects on Radiochromic Film Dosimeters", A. A. Abdel-Fattah and Arne Miller, Radiation. Phys. Chem. Vol. 47, No. 4, pp.611-621, 1996; Elsevier Science Ltd, Great Britain.

5) "Guidelines for the Calibration of Dosimeters for use in Radiation Processing", Peter Sharpe and Arne Miller, Report CIRM 29.

GEX Corporation 7330 S. Alton Way, 12-I Centennial, Colorado 80112 USA
Tel: 303-400-9640 FAX: 303-400-9831 E-mail: sales@gexcorporation.com