



TECHNICAL TIP

COMPARISON OF ALANINE AND RED 4034 DOSIMETRY SYSTEMS

| Attribute | Alanine Dosimetry System | Red 4034 Dosimetry System |
|---|---|--|
| Instrumentation | Electron paramagnetic resonance (EPR) spectrometer | Spectrophotometer Micrometer |
| Dosimeter Description | Alanine substrate pressed into pellet shape with wax for binding material. Pellet is placed into a film package with a bar code that cannot be separated from the film package. | Polymethylmethacrylate (PMMA) molded sheets cut into ~ 3.0x1.1x0.55 mm pieces. Hermetically sealed in a film package. |
| Dosimeter Response (per ASTM) | Dosimeter contains crystalline alanine and registers the absorbed dose by the formation of alanine-derived free radicals. Identification and measurement of the alanine-derived free radicals are performed by EPR spectroscopy. ISO/ASTM 51607 Standard Practice for Use of an Alanine-EPR Dosimetry System | Induction of chemical reactions resulting from irradiation, which create absorption bands in the visible and/or UV regions of the spectrum. Optical absorbance is determined at appropriate wavelengths within these radiation-induced absorption bands and is quantitatively related to absorbed dose. ISO/ASTM 51276 Standard Practice for Use of a Polymethylmethacrylate Dosimetry System |
| Dosimeter Measurement Process | <ul style="list-style-type: none">• Insert alanine dosimeter into spectrometer, system automatically transfers dosimeter bar code into software and begins taking measurement• Dose calculated | <ul style="list-style-type: none">• Users remove dosimeter from packet• Place dosimeters into holder that holds 8 dosimeters• Place holder into spectrophotometer and absorbance transferred into software• Remove dosimeters from holder and read thickness of dosimeters, one at a time• Thickness automatically transferred into software• Dose calculated |
| Influence Quantities (per ASTM) ¹ | Temperature, pellet mass ISO/ASTM 51607 Standard Practice for Use of an Alanine-EPR Dosimetry System | Temperature, humidity, dose rate, post-irradiation response ISO/ASTM 51276 Standard Practice for Use of a Polymethylmethacrylate Dosimetry System |
| Typical Dosimetry System Uncertainty (per ASTM) | ± 4% ISO/ASTM 51607 Standard Practice for Use of an Alanine-EPR Dosimetry System | ± 6% ISO/ASTM 51276 Standard Practice for Use of a Polymethylmethacrylate Dosimetry System |
| Typical Dose Range | 0.5-150 kGy | 5-50 kGy |

¹Influence quantities are compensated for by either the user or the dosimeter manufacturer

FOR MORE INFORMATION

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