PLANAR STORAGE PHOSPHOR DOSIMETER FOR RADIATION THERAPY DOSIMETRY

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Radiation dosimetry is a type of quality assurance for radiation therapy (RT) treatment to verify performance and dosage of the therapy to ensure accuracy and patient safety. To determine beam delivery accuracy, phantom patients (made to mimic necessary properties of the body) are used daily to calibrate the machines. Currently, dosimetry is done with radiographic film which is a single use detector and cannot reliably be calibrated, as it can vary from batch to batch and film to film. Also, the films do not mimic the body, an ideal property when determining the amount of radiation the body is exposed to.

There is significant need for an improved dosimeter with properties that more closely mimic the body along with being reusable for consistent results. Radiologists have started using computed radiography (CR) reusable plates based on $BaFBr_{0.85}I_{0.15}:Eu^{2+}$ instead of x-ray films. The problem with using this as a dosimeter for RT is that the material with high atomic number does not accurately mimic the body. A need exists for a quantitative, reusable, high- resolution dosimeter that may be utilized for radiation therapy quality assurance.

Dr. Li has developed a $KCl:Eu^{2+}$ based CR material that better mimics the body. $KCl:Eu^{2+}$–based dosimeters are characterized by a satisfactory radiation hardness, and can be used at least 100 times at 2Gy per use. Ultra-thin $KCl:Eu^{2+}$–based dosimeters are highly accurate with a dose response close to water thus allowing the material to be utilized as a minimal energy dependent, high-resolution, reusable dosimeter suitable for two dimensional megavoltage beam dosimetry. Therefore, this material at the appropriate thickness is ideal for radiation dosimetry.

Benefits:

- Reusable dosimeter with significant radiation hardness (at least 100 uses)
- Response mimics the body/water
- Sensitivity is appropriate for RT dosimetry
- High-resolution data for accurate dosage information
- Suitable for two dimensional megavoltage beam dosimetry
- Three dimensional dosimetry using stacked measurements
- Automation due to reusability