

Title: Exploring the thermoluminescence characteristics of smartphone screen safety glasses for retrospective dosimetry applications

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Abstract: In clinical settings, standard dosimeters might miss radiation mishaps. Retrospective dosimeters could help to track personnel (such as patients and other staff who don't wear dosimeters) exceeding safe limits and assess long-term exposure trends. This study has investigated key thermoluminescence (TL) dosimetric characteristics, including the glow curve structure, dose-response, energy dependence, sensitivity and fading of various safety glasses that are used as screen protectors of smartphones subjected to photon irradiation. Among the studied glasses, the HD Anti-Peep safety glass for iPhone has been found to exhibit a linear dose-response with a regression coefficient of 99% within the dose range of 2–10 Gy. Moreover, all the safety glasses showed independence with respect to photon energy of 6 MV and 10 MV. The TL glow curves of the samples showed a broad glow peak between 125 °C and 325 °C at 10 Gy. The TL kinetic parameters of the safety glasses were also studied by analyzing the glow curves using the peak shape and initial rise method. The geometric factor (μg) is found to be within the range of 0.43–0.53, which indicates the suitability of applying Chen's general-order formula to calculate the kinetic parameters such as activation energy, frequency factor and trap lifetime. The activation energy (E) and frequency factor (s) are found in the range of 0.31–0.54 eV and 4.55×10^3 to 2.12×10^6 s⁻¹ respectively obtained via the peak shape method. The relatively long trap lifetime and observed thermoluminescence features indicate that the HD Anti-Peep safety glass offers a better option to estimate dose retrospectively to ensure the safety of human health.

Keywords: Thermoluminescence, Retrospective dosimetry, Safety glass; Photon irradiation, Glow curve, Kinetic parameters, Radiation safety

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