RADIOSURGERY DOSIMETRY USING OSL FILM MADE WITH $CASO_4$:EU – A FEASIBILITY STUDY

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Recent studies demonstrated that optically stimulated luminescence (OSL) systems allow the evaluation of doses for 2D mapping in a relatively fast and simple way and results show sub-millimeter resolution (Ahmed et al., 2017; Jahn et al., 2013). The two most advanced-stage studies with satisfactory application in 2D dose mapping are based on commercial prototype detectors (Al_2O_3:C and BeO). Some OSL materials have been evaluated in research laboratories for use in 1D and 2D dose distribution assessments and there is no common sense on the best OSL material for each application (Yukihara and Kron, 2020). This work presents, for the first time, an optically stimulated luminescence (OSL) film made with $CaSO_4$:Eu particles embedded in a silicone elastomer matrix. The OSL film was produced using a low-cost and relatively simple methodology. This film is reusable and the signal can be satisfactorily bleached using blue LEDs. The main dosimetric properties were evaluated using TL/OSL Risoe reader with blue stimulation and Hoya U-340 filter. Investigation shows repeatability within 5% when measuring with the same film sample. Regarding the OSL film homogeneity, nearly 15% sensitivity change was observed within the 5 x 5 cm^2 produced film. Additionally, the dose response curve shows linearity from 5 to 25 Gy. Further studies are necessary to understand and minimize the influence of OSL signal fading, which seems as high as 70% in the first week and then is stable. Nevertheless, a 3 x 3 cm^2 OSL film was successfully used to map dose distribution in radiosurgery (6 MeV photon beam). This work demonstrates the feasibility of 2D dosimetry using low-cost and reusable OSL films based on $CaSO_4$:Eu.

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