

Analysis of Luminescent Characteristics in Silver-Doped Sodium Borate

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Borate matrices are commonly used in luminescent dosimetry due to their effective atomic number (Z_{eff}) being close to that of human tissue. An example is $\text{Li}_2\text{B}_4\text{O}_7$ (LTB) doped with Cu, Ag, P, and Mn in different concentrations to increase its luminescent response, with a minimum detectable dose around 0.5 μGy . In this study, vitreous matrices of pure sodium borate and sodium borate doped with silver were sintered for application in ionizing radiation dosimetry. The luminescent dose-response of the samples was evaluated using Optically Stimulated Luminescence (OSL), Thermoluminescence (TL), and the study of the Photoluminescence (PL) signal for Radiophotoluminescence (RPL) dosimetry applications. In the fluorescence spectra, the aim was to verify the bands attributed to Ag centers and matrix components. Measurements were conducted using the TL/OSL/RPL Automated and Integrated Measurement System (TORAIMS), equipped with an X-ray generator (XRB80N, Spellman), which is capable of performing all RPL, OSL, and TL analyses. Furthermore, the origin of the luminescent signal was investigated. Finally, the TL and OSL curves were fitted using the General Order Kinetics (GOK) model, and the fluorescence bands were fitted with Gaussian curves.