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Investigation of Persistent Blue Emission Soft-Glass Matrix Composite

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Due to the high characteristic temperature of conventional oxide glasses, phosphate-based glasses are studied in applications that require milder temperatures, such as the incorporation of crystalline materials. Soft-Glass Matrix Composite (SGMC) is a composite type material with persistent luminescence (PeL) properties and depend on a host matrix to be widely applied, which provides improved mechanical properties and chemical resistance/durability. SGMC development by incorporation into the glass synthesis requires the addition of PeL microparticles above the melting temperature (T_m), which it could be consumed by the corrosive melt. In this scope, the commercial blue persistent $Sr_2MgSi_2O_7$:Eu^{2+}, Dy^{3+} was incorporated into a glass matrix of composition K_2O-Li_2O-P_2O_5-Nb_2O_5 at a temperature close to the T_m of the already synthesized glass with references to its thermal profile. UV-Vis absorption indicates the transparency of the final composite from 350 to 800 nm. Nano-focus space resolved XRF and XEOL measurements (**Fig. 1**) confirm the non-interaction between the incorporated particles (green) and the glass matrix (dark blue), indicated previously by micro-raman and SEM-FEG-EDX analysis. Additionally, μ-CT findings corroborate the homogeneous dispersion of the crystals in the glass volume mixed in a planetary mixer. Absolute persistence measurement in cd/m^2 shows the same non-interactive regarding the luminescent behavior when compared with pure PeL microparticles. Hence, the methodology was effective in PeL particle preservation into niobiumphosphate glass melt. Future work is required for determining the corrosion potential of the matrix, assessed by heat treatment varying dwell time and temperature.

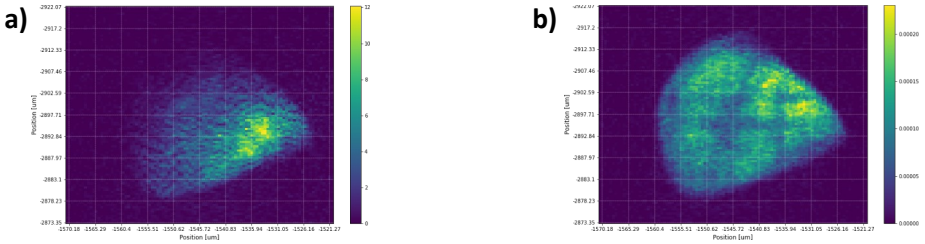

Fig. 1 – Surface image reconstructed from dynamic acquisition of **a)** XRF excited by sincrotron light and **b)** the sum of XRF and luminescence signals.

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References

[1] H. F. Brito *et al.*, Optical Materials Express, **2**, 371 (2012).
[2] L. G. Merízio *et al.*, Optical Materials, **134**, 113046 (2022).