June 23–28, 2024 | University of Pardubice | CR

10th International Conference on Optical, Optoeletronic and Photonic Materials and Applications

Editor: Tomáš Wágner

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UNIVERSITY OF PARDUBICE
FACULTY OF CHEMICAL TECHNOLOGY

Edited by: Tomáš Wágner
Published by University of Pardubice, Studentska 95, 532 10 Pardubice, Czech Republic

ISBN 978-80-7560-521-4

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Integration of rare-earth ions (RE^{3+}) luminescence into additive manufactured micro polymers for sensing applications

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Keywords: 3D-printing, RE^{3+}coordination compound, optical thermometry, optical fiber, imaging

The development of novel materials for sensing applications has garnered significant attention towards additive manufacturing in the past decade. Recent efforts have predominantly focused on achieving intricate structures suitable for sensing, light guidance, and enhancing the numerical aperture for optical fibers. [1] This study specifically centers on the integration of rare earth ions (RE^{3+}: Eu^{3+}, Er^{3+}, Sm^{3+}, and Tb^{3+}) into polymeric structures for both optical temperature and chemical sensing purposes. The printed structures are formulated by combining RE^{3+} coordination compounds, with commercially available resins from Nanoscribe, namely IP-S and IP-L. Subsequently, these structures are printed using a Photonic Professional GT2 printer from the same company.

Figure depicts **(a)** an image captured through Fluorescence Microscopy (FM), highlighting the reddish color emanating from Eu^{3+} emission, [2] along with **(b)** Scanning Electron Microscopy images providing more detailed view. Additionally, the respective **(c)** luminescence spectra at different temperatures are presented. The association between the compounds and the resins have presented energy transfer features based on "antenna effect". The structures have shown potential for temperature sensing and can be used for modifying the tip of an optical fiber.

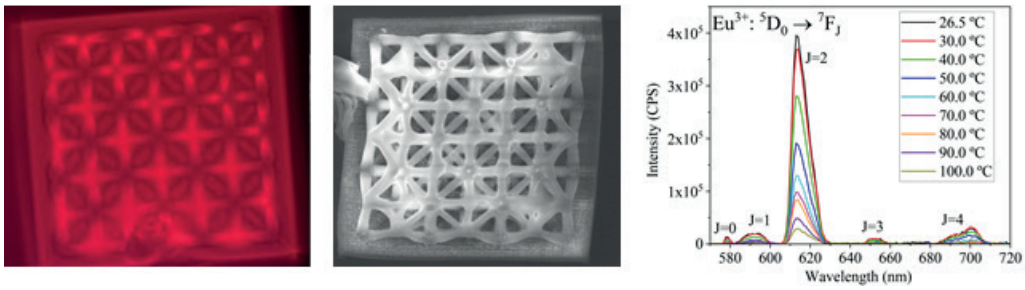

Figure: (a) FM image; **(b)** SEM image; **(c)** micro-PL spectra exciting in 360 nm.

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Acknowledgments

This work was supported by the São Paulo Research Foundation (FAPESP – N. 2022/15958-4) and Carl Zeiss Foundation within its Breakthrough Program (2018).