Engineering Advanced Functional Materials for Nonlinear Optical Applications

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Abstract

The rapid advancement of laser photonics and optoelectronic technologies has significantly increased the demand for advanced nonlinear optical (NLO) materials, particularly for applications such as all-optical switching, optical limiting, and photonic signal processing [1–3]. In this context, semiconductor metal-oxide ultrathin films have emerged as highly promising candidates due to their compatibility with integrated device architectures and their remarkable physical and optical properties. Nanoscale engineering enables precise tailoring of material functionalities through the design of semiconductor nanostructures that exhibit enhanced or synergistic effects. The integration of diverse nanomaterials allows fine control over structural, chemical, and optical characteristics, thereby paving the way for the development of customized materials with superior performance in laser-based and photonic applications [1–3]. In this presentation, we highlight the strong nonlinear optical response of functionalized pyridinium–benzimidazole derivatives [4] and BODIPY dyes, emphasizing their potential for advanced optoelectronic applications such as random lasing, harmonic generation, and organic light-emitting diodes (OLEDs). In addition, recent results on rare-earth-doped $AgGaGe_3Se_8$ are presented, demonstrating a promising pathway toward multifunctional materials for tunable optoelectronic devices [5].

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Recent Publications:

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5. *Small* **2025**, e06651, **DOI: 10.1002/smll.202506651**

Biography

Bouchta SAHRAOUI, Distinguished full Professor at Angers University, is a member of the Photonics Laboratory and a Member of the Hassan II Academy of Science and Technology, Morocco. His research focuses on the development of innovative materials for advanced optoelectronic applications. As an expert in nonlinear optics, he explores the properties of materials to design high-performance photonic and electro-optical devices that meet today's technological challenges. He organized 25 prestigious conferences as a chair or co-chair, he published **460** peer-reviewed publications, with 11700 citations and his Hirsch-index is currently **63** according to Google scholar. He is a member of the editorial boards of 5 prestigious journals, guest editor of **12** special issues on energy and photonics applications. He supervised **22** PhD candidates. He presented more than **50** invited and plenary lectures. He conducted or is involved in **8** European collaborative projects and received **6** awards from the French Ministry of Research and Innovation for his outstanding contributions. Recently, the prestigious US University of Stanford ranked the distinguished Professor SAHRAOUI among the top 2% of the most cited scientists internationally and among the top 2% of scholars who had the greatest impact on the scientific community in 2019-2025. The Stanford classification is based on data from Scopus and Web of science.