Laser-processing of stimuli-responsive materials for the development of functional devices

Alexandra Palla-Papavlu
National Institute for Laser, Plasma and Radiation Physics, Magurele, RO-077125, Romania

Abstract

Laser-processing techniques offer innovative and versatile methods for the development of stimuli-responsive materials, which are essential in creating advanced functional devices, particularly aiming at sensor applications. This paper explores the role of laser-based methods, including Laser-Induced Forward Transfer (LIFT) and Matrix-Assisted Pulsed Laser Evaporation (MAPLE), in the precise deposition of materials for various applications. The ability to deposit nanocomposite materials using LIFT and MAPLE enables the development of gas sensors with high selectivity and sensitivity to pollutants, temperature, or humidity changes.

The unique advantages of laser-based deposition methods, such as spatial control, minimal material waste, and the capability to tailor material properties, are highlighted. Their application in sensor fabrication demonstrates improved performance in terms of sensitivity, selectivity, and miniaturization. The findings underscore the potential of laser-processing technologies to advance the development of next-generation smart devices for environmental monitoring, healthcare diagnostics, and wearable electronics.