



14<sup>th</sup> International Conference on  
**Optics, Photonics & Laser**

## Colorimetric Monitoring of Humidity by Opal Photonic Hydrogel

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The present study demonstrated a new fast colorimetric humidity sensor using the opal hydrogel composite (OHC). First, a highly monodisperse polystyrene (PS) latex was synthesized by soap-free emulsion polymerization and deposited on a glass substrate in order to form a three-dimensional opal photonic crystal. Then, the homogenous hydrogel precursor was infiltrated into the interstitial space of opal by capillary forces and underwent chemical polymerization to construct an embedded PS crystalline colloidal array within a poly (acrylamide-co-acrylic acid) hydrogel network. The scanning electron microscopic images confirmed the formation of opal structures. An interesting feature of the presented OHC sensor is that the sensor is transparent in a dry state and an increase in relative humidity (RH) leads to a colorful film. In addition, UV/Vis spectroscopy was performed within an RH range of 25-95%, indicating that reflection peak height gradually develops by RH increasing and the peak position shifts from 413 to 518 nm. Further, the sensor functions extremely rapidly and changes its color by increasing RH within a few seconds (less than 3 s) and becomes transparent again quickly as humidity represents a decrease. Based on the results, repeated humidity changes revealed that the sensor has an excellent reproducibility without any reduction in response time and sensitivity or a color change. Finally, it has good adhesion to the glass substrate which makes it a suitable RH sensor in different applications, along with the rapid response time, high sensitivity, repeatability, and the visual alarm.

### Biography

*Mohammad Bagher Sobhanimatin has completed his PhD at the age of 31 years from Amirkair University of Technology and is finding for a suitable postdoctoral position in his field. He has worked on different areas including polyacrylamide hydrogels, emulsion polymerization, colloids and colloid self assembly, photonic crystals (opal preparation), polyurethanes, NBR and EPDM elastomers, aging. He has published 3 papers in the journals and has been serving as a researcher in R & D section of a company.*