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Modified photonic structures created by holography: Application to metal ions sensing

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The aim of the presented research is to fabricate and test portable holographic sensors for analytes in liquids. The characteristics that are targeted are simplicity of operation, selectivity, sensitivity and relatively low cost. In order to achieve this aim, photonic devices are fabricated by holographic patterning, with a view to their application in environmental and biomedical sensing. Different types of analyte sensitive materials are used to functionalise the surfaces of these photonic devices. The sensors reported here are created by holographic recording of surface relief structures in a self-processing photopolymer material. The proposed technique is used as a platform for the fabrication of sensors with readily varied selectivity. In this work we demonstrate that the photonic structures are modified by three different materials in order to achieve sensitivity to three different target analytes. LTL-zeolite nanoparticles were used to fabricate a sensor for detection of copper, calcium and lead ions in fresh water. The current detection limit of the sensors' response to water is 63 ppm. The surface structures were also functionalized by coating with dibenzo-18-crown-6 and Tetraethyl p-tert-butylcalix[4]arene for detection of K⁺ and Na⁺, respectively. Both Ionophores have great potential in fabrication of highly sensitive and selective biosensors and the performance of the sensors was investigated. It was observed that functionalisation with dibenzo-18-crown-6 provided a selective response of the devices to K⁺ over Na⁺ and Tetraethyl p-tert-butylcalix[4]arene provided selective response to Na⁺ over K⁺. The sensors respond to K⁺ and Na⁺ within the physiological ranges, which are 3-5 mM and 133 -145 mM, respectively.

Biography

Sabad-e-Gul has due to submit her PhD thesis fall this year from Dublin Institute of Technology, Dublin, Ireland. She did M.Phil (Polymer Technology) from University of the Punjab Lahore, Pakistan. She was first elected president of SPIE chapter (DIT). Her research work has been published in more than 7 papers in reputed journals and has been a research assistant on enterprise Ireland projects.

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