1. Record Nr. UNINA9910298627303321

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Titolo	Holographic Sensors / / by Ali Kemal Yetisen
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2015
ISBN	3-319-13584-8
Edizione	[1st ed. 2015.]
Descrizione fisica	1 online resource (175 p.)
Collana	Springer Theses, Recognizing Outstanding Ph.D. Research, , 2190-5053
Disciplina	54 610724 615.19 660
Soggetti	Chemical engineering Medicinal chemistry Laboratory medicine Industrial Chemistry/Chemical Engineering Medicinal Chemistry Laboratory Medicine
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references.
Nota di contenuto	Introduction -- Materials and Methods -- pH-Responsive Holograms -- Divalent Metal Cation Selective Holographic Sensors -- Glucose-Responsive Holograms and Clinical Trials on Diabetic Patients -- A Smartphone Algorithm for the Quantification of Colorimetric Assays -- Final Discussion.
Sommario/riassunto	This thesis presents a theoretical and experimental approach for the rapid fabrication, optimization and testing of holographic sensors for the quantification of pH, organic solvents, metal cations, and glucose in solutions. Developing non-invasive and reusable diagnostics sensors that can be easily manufactured will support the monitoring of high-risk individuals in any clinical or point-of-care setting. Sensor fabrication approaches outlined include silver-halide chemistry, laser ablation and photopolymerization. The sensors employ off-axis Bragg diffraction gratings of ordered silver nanoparticles and localized

refractive index changes in poly (2-hydroxyethyl methacrylate) and polyacrylamide films. The sensors exhibited reversible Bragg peak shifts, and diffracted the spectrum of narrow-band light over the wavelength range peak 495-1100 nm. Clinical trials of glucose sensors in the urine samples of diabetic patients demonstrated that they offer superior performance compared to commercial high-throughput urinalysis devices. Lastly, a generic smartphone application to quantify colorimetric tests was developed and tested for both Android and iOS operating systems. The sensing platform and smartphone application may have implications for the development of low-cost, reusable and equipment-free point-of-care diagnostic devices.