MEMS BASED MICROFLUIDIC STRUCTURE FOR BIOLOGICAL AND

CHEMICAL SENSOR ARRAY

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A micromachined fluidic sensor array has been developed for the rapid characterization of multiple analytes in solution. A simple micromachined fluidic structure for this chemical and biological detection system has been designed and fabricated, and its operational characteristics have been investigated. Sensing occurs via optical changes to indicator molecules (receptors) that are attached to polymeric microspheres (beads). A separate optical detector, typically a charged-coupled-device (CCD), is used for the simultaneous acquisition of the optical data from selectively arranged beads in micromachined cavities. The fluidic structure for supporting the beads has been designed to be compatible with this hybrid optical detection system. The structure consists of three layers: cover glass,

micromachined silicon, and glass substrate. The fabrication has been ordered to protect receptors that may be changed in their characteristics during the fabrication. The bottom two layers, micromachined silicon and glass substrate, are fabricated first, and the beads are selectively placed into micromachined cavities. Then, cover glass is applied to confine the beads. This structure utilizes surface tension force to draw a liquid sample into the sensor array without moving components, producing a compact, portable, and potentially low-cost device. The fluid flow has been observed using test structures and beads that are sensitive to the sample fluid, allowing time domain characterization of the fluid flow. The test results show that this system may be useful in a micro total analysis system (m-TAS), especially in disposable biomedical applications.

Table of Contents

List of Tables

List of Figures