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Integrated Flavor Sensor Using Microbead Array

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Abstract : This research presents the design, fabrication and application of a flavor sensor for an integrated electronic tongue and electronic nose that can allow rapid characterization of multi-component mixtures in a solution. The odor gas and liquid are separated using hydrophobic porous membrane in micro fluidic channel. The sensor uses an array composed of microbeads in micromachined cavities localized on silicon wafer. Sensing occurs via colorimetric and fluorescence changes to receptors and indicator molecules that are attached to termination sites on the polymeric microbeads. As a result, the sensor array system enables simultaneous and near-real-time analyses using small samples and reagent volumes with the capacity to incorporate significant redundancies. One of the key parts of the system is a passive pump driven only by capillary force. The hydrophilic surface of the fluidic structure draws the sample into the sensor array without any moving mechanical parts. Since there is no moving mechanical component in the structure, the size of the fluidic structure can be compact and the fabrication becomes simple when compared to the device including active microfluidic components. These factors should make the proposed system inexpensive to mass-produce, portable and compatible with biomedical applications.

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