thermoelectric properties predicted by use of this model.

The semiclassical transport model with which this tight-binding model is coupled is a solution of Boltzmann's transport equation in the constant-relaxation-time approximation. The combination of models has been found to yield calculated values of thermoelectric properties within a few percent of experimentally determined values (for example, see figure).

This work was done by Seungwon Lee and Paul Von Allmen of Caltech for NASA's Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov.
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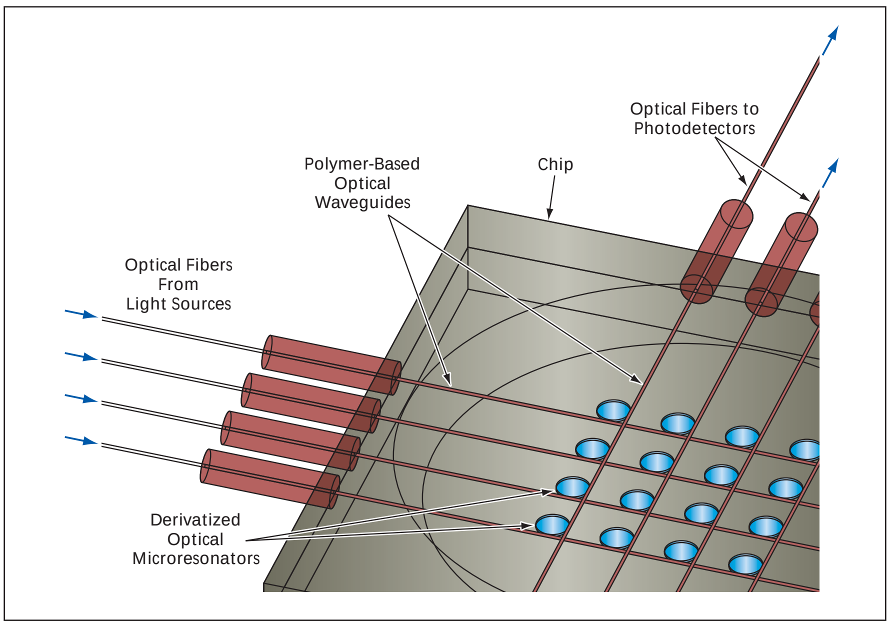
Integrated Miniature Arrays of Optical Biomolecule Detectors

Many biochemical species could be detected simultaneously.

NASA's Jet Propulsion Laboratory, Pasadena, California

Integrated miniature planar arrays of optical sensors for detecting specific biochemicals in extremely small quantities have been proposed. An array of this type would have an area of about 1 cm^2. Each element of the array would include an optical microresonator that would have a high value of the resonance quality factor ($Q \approx 10^7$). The surface of each microresonator would be derivatized to make it bind molecules of a species of interest, and such binding would introduce a measurable change in the optical properties of the microresonator. Because each microresonator could be derivatized for detection of a specific biochemical different from those of the other microresonators, it would be possible to detect multiple specific biochemicals by simultaneous or sequential interrogation of all the elements in the array. Moreover, the derivatization would make it unnecessary to prepare samples by chemical tagging.

Such interrogation would be effected by means of a grid of row and column polymer-based optical waveguides that would be integral parts of a chip on which the array would be fabricated. The row and column polymer-based optical waveguides would intersect at the elements of the array (see figure). At each intersection, the row and column waveguides would be optically coupled to one of the microresonators. The polymer-based waveguides would be connected via optical fibers to external light sources and photodetectors. One set of waveguides and fibers (e.g., the row waveguides and fibers) would couple light from the sources to the resonators; the other set of waveguides and fibers (e.g., the column waveguides and fibers) would couple light from the microresonators to the photodetectors. Each microresonator could be addressed individually by row and column for measurement of its optical transmission. Optionally, the chip could be fabricated so that each microresonator would lie inside a microwell, into which a microscopic liquid sample could be dispensed.



Derivatized Optical Microresonators in an array would address optically via row and column optical waveguides.

This work was done by Vladimir Iltchenko, Lute Maleki, Ying Lin, and Thanh Le of Caltech for NASA's Jet Propulsion Laboratory.

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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