DRUG DISCOVERY

Microfluidic Injector

Silicon drop ejector technology involves the delivery of very precisely metered, small volumes of liquid from a fluid manifold (which mixes or splits off various fluid lines) to a target substrate. Sandia has taken this science a step further by developing an extremely small MEMS ejector that can produce patterns of drops of 2–10 microns in diameter. The device that positions the MEMS drop ejector can place small amounts of material very precisely onto a substrate with an accuracy of within 1 micron. Such precise patterns of minute amounts of material could be the basis of organic electrical circuits, which are key to the development of very small processors for micro applications. Significant interest in the drop ejector capability has been expressed by several groups, including the chem.-lab-on-a-chip group, to deposit adsorbing coatings onto specific locations in sensors (e.g., bio-chemical weapons detecting sensors).

Two picoliter drops are ejected at 10 m/s and 1 KHz using an electrostatic drop ejector fabricated in Sandia's surface micromachining MEMS technology.

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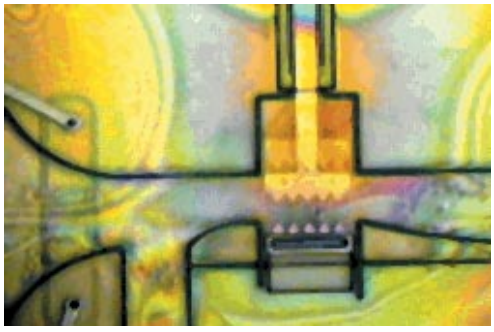
BioMEMS

Silicon microdevices are micromachines capable of interacting at the cellular level. Sandia is breaking new ground in developing these cell-altering devices. Prototype devices offer the possibility of considerable mechanical intervention at the cellular level because of the parallel operation potential. Microneedles could potentially rapidly inject DNA, RNA, or proteins (including drug molecules) into living cells at precise points.



SANDIA's MICROTEETH bite in a channel that is 20 microns wide.

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Transdermal Drug Delivery

Sandia is developing mass-transfer models to better understand drug-delivery processes and chemical transport through the skin. Constitutive relations and simulation

methods developed for chemical transport in porous geologic media may be applicable to the heterogeneous features and layers of the skin, providing for improved modeling capabilities in an arena dominated by empirical studies. We hope to develop these models as a means to improve drug-delivery devices such as transdermal patches and to improve risk assessments of dermal exposures to toxic chemicals.

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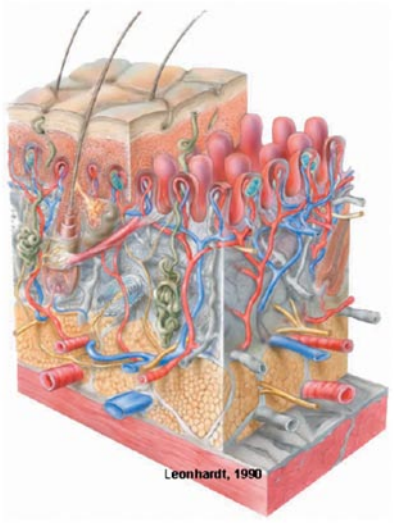

Anatomy of human skin. (Leonhardt, 1990)

LOCKHEED MARTIN

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