Smart miniature drug delivery systems

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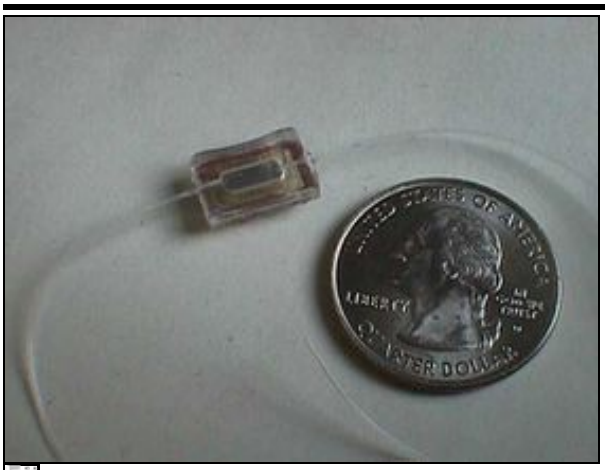
Background

Introduction

- **The smart miniature drug delivery system** is for delivering the drugs to the host.Biological information is detected by biological sensors, the information is analyzed and drug delivery system is actuated to deliver the drug based on the information.
- This system utilizes MEMS or NEMS technology based drug pumps, micro-pumps, micro-needles, micro-osmotic pumps, Nano-pumps.
- It also includes sensors or communication systems to activate or control pumps.
- Microsystems technologies are changing the Life Sciences industry. New in vitro diagnostic systems, new therapy strategies, genetic diseases treatment, targeted and intelligent drug delivery, artificial pancreas, drug discovery processes are health improvement promised to the future generations, enabled by semiconductor and MEMS technologies. The Life Sciences industry already faces critical challenges to take its way to its expected market.
- The bar graph below gives details of the MEMS component for lifescience market
- Micro- and nano-electromechanical systems (MEMS or NEMS)-based drug delivery devices offer opportunities to address unmet medical needs related to dosing. Such devices should be considered when conventional dosing methods perform suboptimally in terms of safety, efficacy, pain, or convenience. In addition, applications of these technologies may create totally new drug delivery paradigms. MEMS technologies may create new therapies with existing molecular entities.

Some of the MEMS based drug delivery systems are listed below

Micropumps

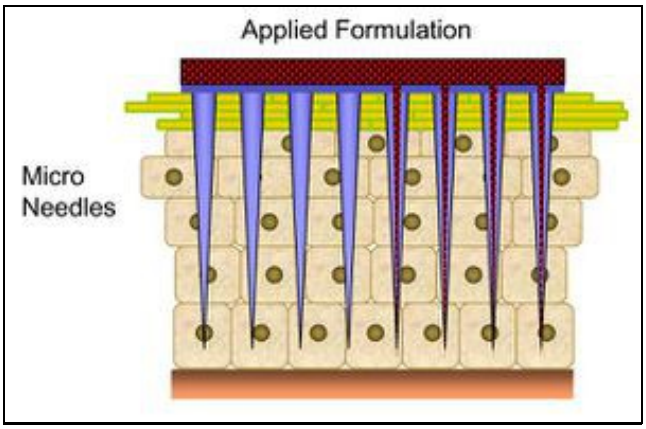


Micropump Source

- Although any kind of small pump is often referred to as micropump, a more accurate and up-to-date definition restricts this term to pumps with functional dimensions in the micrometre range. Such pumps are of special interest in microfluidic research, and have become available for industrial product integration in recent years. Their miniaturized overall size, potential cost and improved dosing accuracy compared to existing miniature pumps fuel the growing interest for this innovative kind of pump.
- Micropumps can be grouped into mechanical and non-mechanical devices: Mechanical systems contain moving parts, which are usually actuation and valve membranes or flaps. The driving force can be generated by utilizing piezoelectric, electrostatic, thermo-pneumatic, pneumatic or magnetic effects. Non-mechanical pumps function with electro-hydrodynamic, electro-osmotic or ultrasonic flow generation.

Source

Microneedles



- Microneedles were first developed as a method for transdermal drug delivery . The microneedles

are long enough to penetrate the stratum corneum, which often acts as the primary barrier to drug transport across the skin, but are short enough to avoid the nerves located in the dermis, potentially offering a painless method for drug delivery.

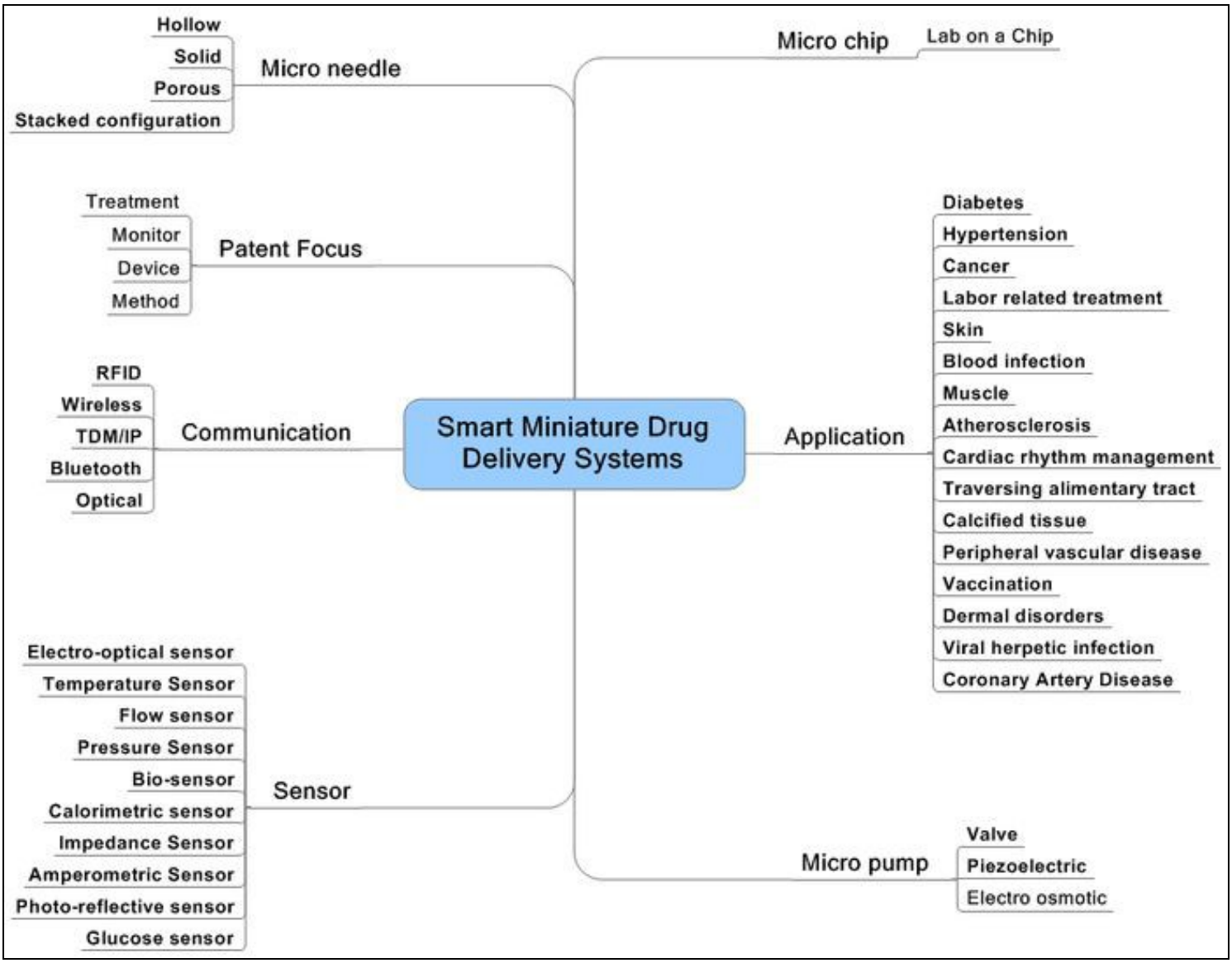
- The microneedles can be divided into "In-Plane" and "Out of plane" microneedle based o fabrication methods and as "Hollow" and "Solid" Microneedles based on their physical aspects.

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Taxonomy



Taxonomy

Search concepts

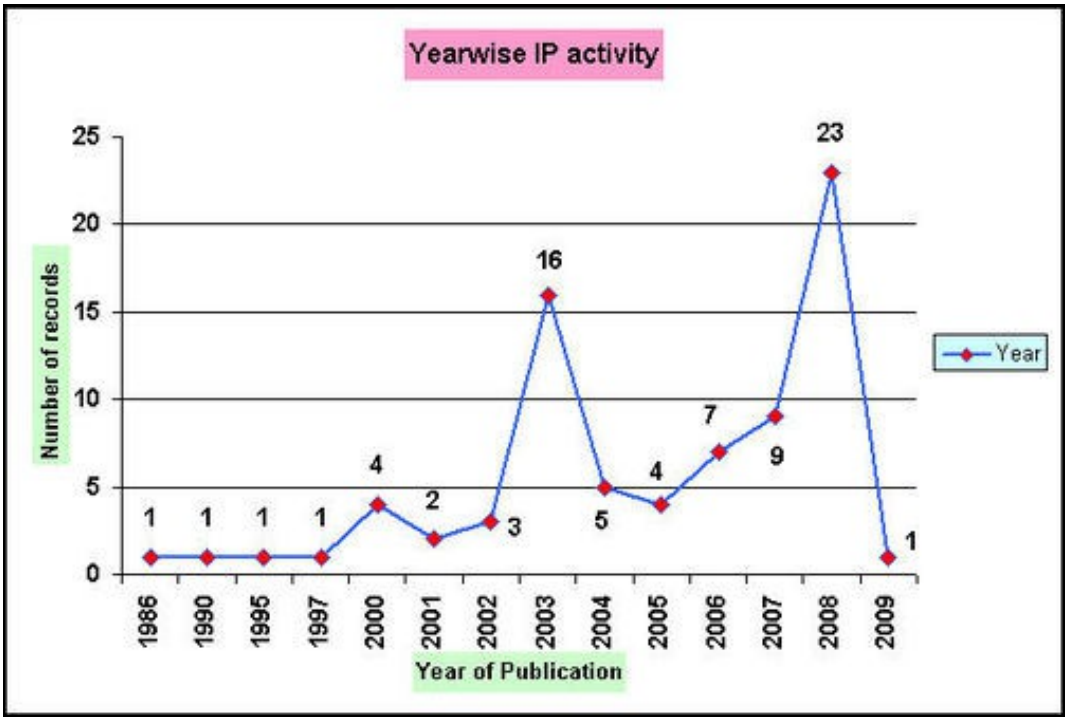
S. No.	Concept 1	Concept 2	Concept 3	Concept 4	Concept 5	Concept 6
	Mems	Nems	Drug	Sensor	Communication	Delivery
1	Microelectromechanical Systems	Nanoelectromechanical Systems	Medicament	Biosensor	Bioinformation technology	Inject*4
2	Microsystem Technology	BioNems	Pharmaceutic*2	Smartsensor	Telemetry	Perfus*3
3	BioMems	Nanopump	Medic*5	Microsensor		Infus*3
4	Micropump	Nanopump				Diffus*3
5	Microneedle					Releas*
6	Mems Drugpump					
7	Lab micro chip					
8	Microosmotic pump					
9	Lab on a chip					

Search strategy

S. No.	Concept	Search Query	Scope	Year	Hits
1	MEMS	(((Microelectromechanical) OR (Micro ADJ ((System*1 ADJ Technology) OR (Electromechanical))) OR (MEMS) OR (BioMEMS) OR (Bio ADJ2 MEMS) OR (Microtechnology) OR (Micro ADJ Electro ADJ Mechanical)) OR (Drug ADJ2 Pump) OR (Micro ADJ2 Pump*1) OR(Micro ADJ2 Needle*) OR (Micro ADJ2 Osmotic*) OR Micropump* OR Microneedle* OR Microosmotic* OR (Lab ADJ on ADJ a ADJ chip)OR (Lab ADJ2 Micro ADJ2 Chip))	Title/Abstract/Claims	1836-2009	24396
2	NEMS	(Nanoelectromechanical OR NEMS OR (Nano ADJ Electromechanical) OR (Nano ADJ Electro ADJ Mechanical) OR BioNEMS OR (Bio ADJ2 NEMS) OR (Nano ADJ Pump*1) OR Nanopump OR (Nano ADJ2 Needle*1) OR Nanoneedle*1)	Title/Abstract/Claims	1836-2009	474
3	Drug Delivery	(Drug OR Pharmaceutic*2 OR Medic*5) Near10 (Deliver*4 OR Inject*4 OR Perfus*3 OR Infus*3 OR Diffus*3 OR Releas*)	Full Spec	1836-2009	336156
4	Sensor/Communication	(*sensor) OR (Sensor*1) OR Communicat*3 OR Telemetry OR (Bio ADJ2 IT) OR (Bio ADJ2 Information)	Title/Abstract/Claims	1836-2009	3257001
5	Final Query	(1 OR 2) AND 3 AND 4			1225(531 unique patents)

IP Activity

Year wise IP activity



Year wise IP activity

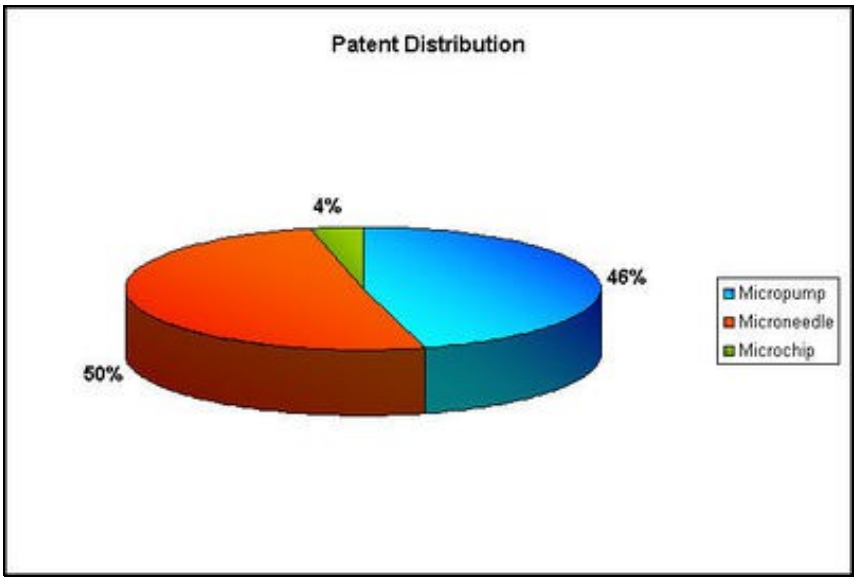
Top Assignees



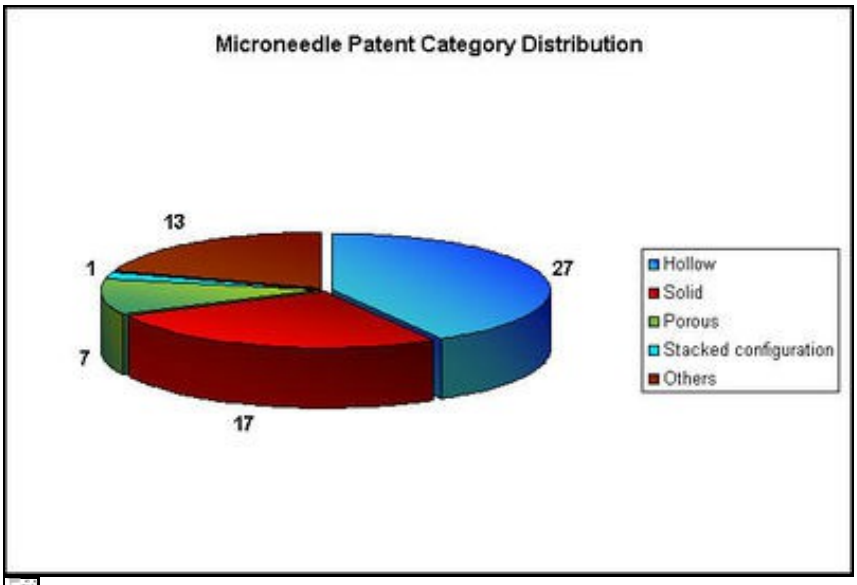
Top Assignees
Other assignees with one record

It can be inferred from the graph that out of the **78 ON** target patents **Biovalve Technologies Inc.** is the Top Assignee in the Smart drug delivery system based on MEMS/NEMS

Patent Distribution



Patent Distribution



Microneedle Patent category Distribution

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Analysis sheets

On target records

- **ON Target Analysis**

Off target records

- **OFF-target records**

Dashboard link

Dashboard

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