Sensors and Materials, Vol. 19, No. 8 (2007) 453–464
MYU Tokyo

S & M 0696

Microneedle System for Localized Drug Injection Using Embedded Microfluid Source

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(Received May 8, 2007; accepted September 7, 2007)

Key words: microneedle, drug injection, microfluid source, azobisisobutyronitrile (AIBN), microheater

In this paper, we present a novel microneedle system for injecting drugs using an embedded microfluid source. This microneedle system consists of in-plane microneedles, a drug reservoir, a chemical fluid source, a chemical fluid source chamber, and a microheater. The microneedles, drug reservoir, and chemical fluid source chamber are connected by microchannels. The chemical fluid source, azobisisobutyronitrile (AIBN) decomposes and produces nitrogen gas and a free radical at approximately 70° C. Using this phenomenon, the AIBN on the microheater generates nitrogen gas upon the application of electrical power, and then the generated gas injects the drug in the drug reservoir through the microchannels to the microneedles. This system can inject 2.29–2.9 μl blue ink in approximately 6 s at a voltage and current of 30.4 V and 164 mA, respectively, using 5 μl AIBN. This novel microneedle system is expected to be applicable to highly precise biological experiments.

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