



## Laser Drilling Quartz to Make Patch Clamp Plate Arrays

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**WARF: P100021US01**

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**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method for drilling smooth nanoscale holes in single crystal quartz.**

### Overview

Patch clamping is a well-known technique for investigating the movement of ions and molecules through cellular membranes via ion channels. To create an extremely high-resistance 'gigaseal' around an ion channel, the method employs a substrate with minute pores. This kind of investigation plays an important role in drug discovery and medical research because approximately 50 percent of all diseases affect the function of ion channels.

In current practice, planar patch clamps are popular because they allow automatic, parallelized study of multiple samples on a substrate (wafer, chip or well-plate). These substrates can be made of materials like glass or silicon. Single crystal quartz is especially desirable given its unique electrical properties, hardness and stability.

Unfortunately, micromachining nanoscale holes in quartz can be frustrating and slow with conventional techniques like lithography and laser beam ablation. A faster method, using ultraviolet (UV) lasers, has been successfully used to 'drill' non-quartz substrates. Since quartz is transparent to and largely unaffected by UV wavelengths, this type of laser has been discounted for quartz applications until now.

### The Invention

UW-Madison researchers have developed a technique to form pores as small as 200 nanometers in single crystal quartz. The process can employ UV-emitting excimer lasers or other types of lasers.

In the new technique, the quartz substrate is backed by an energy absorbing material like acetone and/or fluorescent immersion oil, which absorbs UV radiation. When the laser is directed into the quartz, it passes through and strikes this absorbing material. The material increases in temperature, melting a small pore or crater in the overlying quartz.

### Applications

- High yield production of patch clamp plates for electrophysiology

### Key Benefits

- Produces very smooth nanoscale holes

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- Superior gigaseals
- One-step micromachining process for quartz

- Enables scale up, automation and analysis of multicell arrays

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- Enables probing mechano-sensitive ion channels in an on-chip fashion, which was not previously possible
- Transparent substrates like quartz permit both electrical and optical measurements.

## Additional Information

### Related Technologies

- [WARF reference number P07471US describes a method for laser drilling patch clamp plate arrays made of glass.](#)

### Related Intellectual Property

- [View Divisional Patent in PDF format.](#)

### Tech Fields

- [Drug Discovery & Development : Preclinical testing](#)
- [Engineering : Micro & nanotechnologies](#)

For current licensing status, please contact Jennifer Gottwald at [jennifer@warf.org](mailto:jennifer@warf.org) or 608-960-9854

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