



Mass Sensor

Federal Manufacturing & Technologies

B. E. Adams

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Final Report/CRADA Project Accomplishments Summary

CRADA Number 98KCP1070

Approved for public release; distribution is unlimited.



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Honeywell

Federal Manufacturing  
& Technologies

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A prime contractor with the United States

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**Honeywell**

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Date: 7/15/2000

Revision:

### A. Parties

The project is a relationship between

Honeywell International Inc.

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PO Box 419159

Kansas City, MO 64141-6159

Mass Sensors, LLC

PO Box 12466

St. Louis, MO 63132

### B. Background

The current state-of-the-art mass spectrometer is a large, non-mobile piece of laboratory equipment, requiring samples of gases to be delivered directly to the unit. This project was based upon a mobile hand-carry system with the ability to "sniff" the air and identify the components. The analyzer was to be approximately one inch square and ¼ inch thick. Mass Sensors had a patented design which they were interested in fabricating using ceramic materials. Honeywell had experience fabricating electronic networks on ceramic. The analyzer was an extension of this technology.

### C. Description

The purpose of this CRADA was to use Honeywell's experience in low temperature cofire ceramics and traditional ceramics to assemble a relatively low-cost, mass-producible miniature mass analyzer. The specific design, given to us by Mass Sensors, LLC, was used to test for helium.

### D. Expected Economic Impact

The direct benefit for the participant was to have a prototype unit assembled for the purpose of proof of concept and the ability to secure venture capital investors. From that, the company would begin producing their own product for sale. The consumer/taxpayer benefits come from the wide variety of industries that can utilize this technology to improve quality of life. Medical industry can use this technology to improve diagnostic ability; manufacturing industry can use it for improved air, water, and soil monitoring to minimize pollution; and the law enforcement community can use this technology for identification of substances. These are just a few examples of the benefit of this technology.

### E. Benefits to DOE

The benefits to DOE were in the area of process improvement for cofire and ceramic materials. From this project we demonstrated nonlinear thickfilm fine lines and spaces that were 5-mil wide with 5-mil spaces; determined height-to diameter-ratios for punched and filled via holes; demonstrated the ability to punch and fill 5-mil microvias; developed and demonstrated the capability to laser cut difficult geometries in 40-mil ceramic; developed and demonstrated coupling LTCC with standard alumina and achieving hermetic seals; developed and demonstrated three-dimensional electronic packaging concepts; and demonstrated printing variable resistors within 1% of the nominal value and within a tightly defined ratio.

### F. Industry Area

The capability of this device makes it invaluable for many industries. The device could be used to monitor air samples around manufacturing plants. It also could be used for monitoring automobile exhaust, for doing blood gas analysis, for sampling gases being emitted by volcanoes, for studying activities of insects, and many other things.

### G. Project Status

The ultimate goal was to build two iterations of the mass sensor. However, due to technical difficulties, only one iteration of the device was manufactured. Initial work to optimize the ion source and build a small ion pump was not successful. Consequently, the ion pump was not incorporated into the analyzer design. Mass Sensors, LLC, is still testing the analyzers that were assembled.

### H. Point of Contact for Project Information

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#### I. Company Size and Point of Contact

This is a start-up company. The point of contact is Phil Burger at 314-997-7156.

#### J. Project Examples

Mechanical samples, a stereolithographic replica made at the 5X scale, and photos of each part of the analyzer are the only examples of the device.

Figure 1 is a photo at the final assembly.

#### K. Technology Commercialization

The successful conclusion of this project was one of the early steps taken by Mass Sensors, LLC, for securing venture capital to start up a company with this as its product. Mass Sensors is still in the development stages, but envisions building a large successful company based upon their design of a miniature mass spectrometer.

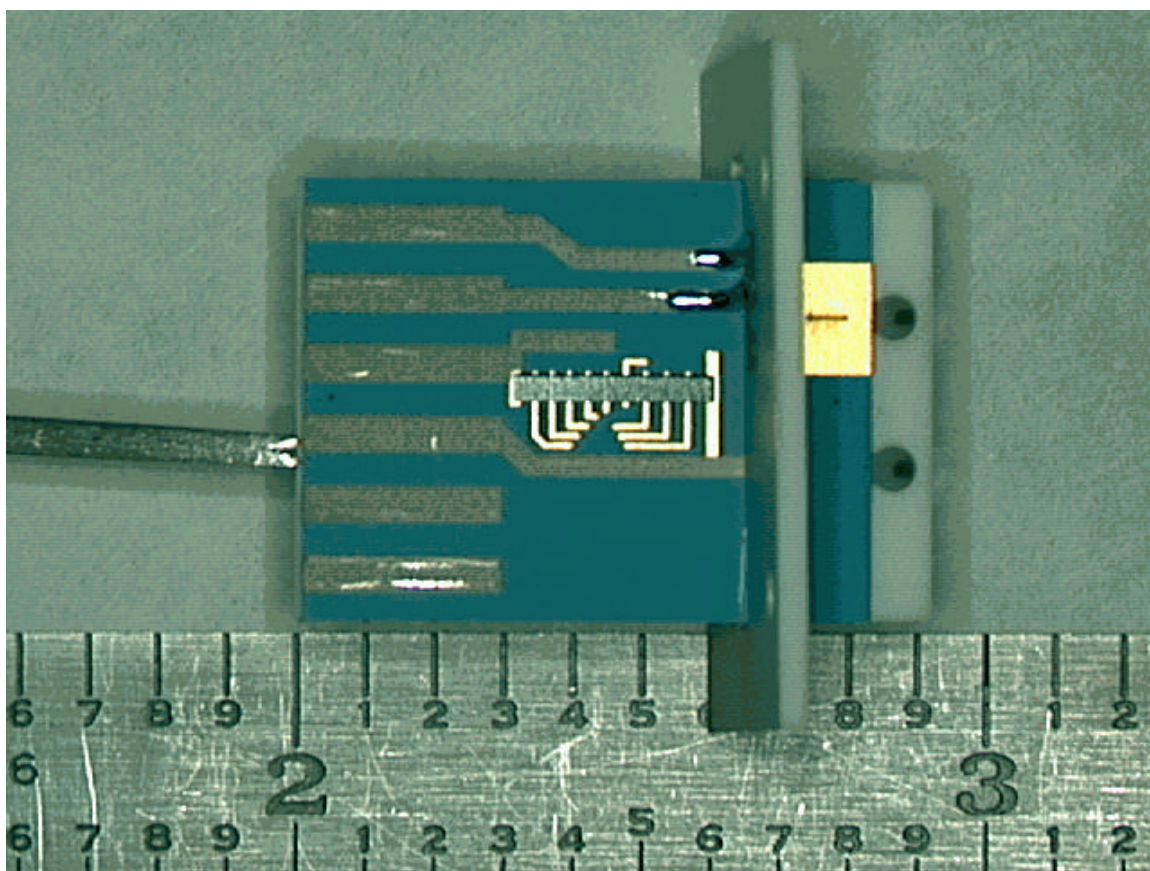


Figure 1. Mass Analyzer