



## Highly sensitive fluorescence microwave microscope

**The Challenge:** Optical microscopy is a well-established technique that has wide ranging applications for imaging molecular dynamics of biological systems. Typically, these applications rely on external temperature controllers to maintain or change reaction rates of these biological systems. With increasing interest in applying low power microwaves to drive biological and chemical reactions, UMBI scientists have combined optical and microwave-based technologies, and have developed a fluorescence microscope in a microwave cavity.

**UMBI Solution:** UMBI investigators have constructed a highly sensitive real-time fluorescence imaging microscope in a microwave cavity. Microwaves have been shown to accelerate the rate of chemical reactions and enzyme-catalyzed biological reactions. With the Fluorescence Microwave Microscope, the inventors have found a means to optically image biological systems inside microwave cavities during the application of microwave pulses.

### Commercial Applications:

Real-time imaging of microwave or radiofrequency driven biomolecular reactions including protein-protein, DNA-protein, RNA-Protein, DNA-RNA, chemical-protein, chemical-DNA interactions in prokaryotic and eukaryotic organisms, at interfaces, on surfaces and in solutions.

### Advantages:

With the fluorescence microscope in a microwave cavity, an analysis of the microwave effects on the interactions of biomolecules *in vitro* and *in vivo* is now possible. While we have currently demonstrated applications that are limited to the imaging of bulk solutions, work is now underway to construct a confocal microscope that will allow us to perform single molecule and fluorescence correlation spectroscopy experiments.

**Stage of Development:** Working prototype has been built.

**Patent Status:** A PCT patent application is pending

**Licensing Potential:** UMBI is seeking non-exclusive and exclusive licensees to all or part of this technology. The UMBI inventors would welcome the opportunity to work with any licensee to further refine or extend the capabilities this invention.

**Inventors and UMBI reference:** Geddes and Previte, 07-018

### **Related Publications:**

1. Fluorescence microscopy in a microwave cavity, Michael J.R. Previte, Chris D. Geddes, *Optics Express* 15(18), 11640-11649 (2007).
2. Aslan K, Geddes CD. 2006. Microwave-accelerated metal-enhanced fluorescence (MAMEF): application to ultra fast and sensitive clinical assays. *J Fluoresc.* 16(1):3-8.
3. Aslan K, Geddes CD. 2005. Microwave-accelerated metal-enhanced fluorescence: platform technology for ultrafast and ultrabright assays. *Anal Chem.* 77(24):8057-67.
4. Real-time thermal imaging of microwave accelerated metal-enhanced fluorescence (MAMEF) based assays on sapphire plates, Michael J.R. Previte, Kadir Aslan, Yongxia Zhang, Chris D. Geddes, *Journal of Fluorescence*, 17(6), 639-642 (2007).
5. Microwave-accelerated metal-enhanced fluorescence: an ultra-fast and sensitive DNA sensing platform, Kadir Aslan, Stuart N. Malyn, Geetika Bector, Chris D. Geddes, *Analyst*, 132, 1122-1129 (2007).
6. Microwave-accelerated metal-enhanced fluorescence: application to detection of genomic and exosporium anthrax DNA in <30 seconds, Kadir Aslan, Yongxia Zhang, Stephen Hibbs, les Baillie, Chris D. Geddes, *Analyst*, 132, 1130-1138 (2007).
7. Microwave-Accelerated Metal-Enhanced Fluorescence (MAMEF) with silver colloids in 96-well plates: Application to ultra fast and sensitive immunoassays, High Throughput Screening and drug discovery, Kadir Aslan, Patrick Holley, Chris D. Geddes, *Journal of Immunological Methods* (2006), 312, 137–147.

### **Contact Information:**

Jonathan Gottlieb, PhD, MBA  
Director, Technology Transfer and Commercialization  
Office of Research, Innovation & Commercialization

University of Maryland Biotechnology Institute  
9600 Gudelsky Drive, Suite 2105L  
Rockville MD 20850

Phone: (240) 314-6506

Mobile: (443) 468-9875

Email: [gottlieb@umbi.umd.edu](mailto:gottlieb@umbi.umd.edu)

<http://www.umbi.org>