



## Integrated Thin-Film Fluorescence Detector Technology (ITFD)

### Technology

This patented detector technology combines thin-film technology with a solid-state detector to create an integrated device for measuring fluorescence on a chip-sized scale.

### Benefits

Because of its reduced size and potentially higher sensitivity, this device could lead to new and improved products for multiple industries. The direct benefits of using the integrated thin-film fluorescence detector (ITFD) include

- Lower manufacturing costs
- Instrument portability
- Increased sensitivity
- Lower operational complexity
- Improved signal-to-noise ratios

### Commercial Applications

Fluorescence spectroscopy is widely employed in many different industries to detect a broad spectrum of chemicals. Industries that may potentially find the technology useful include the following:

#### Environmental monitoring

- Onsite detection of pollutants
- Water, soil, and air pollution
- Chemical/biological warfare detection

#### Medical diagnostics

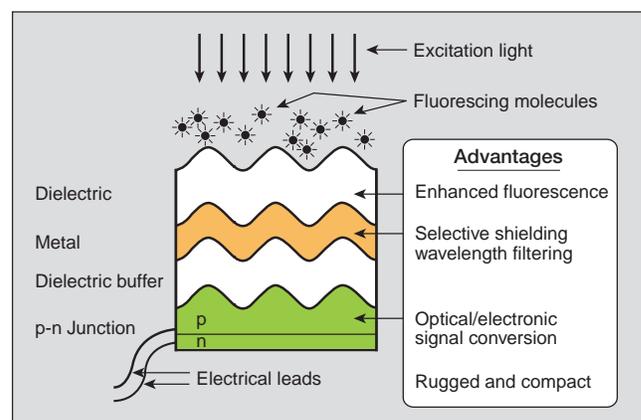
- Point-of-care testing
- Bioinformatics

### Chemical analysis

- Process and quality control
- Flow-injection analysis

### Technology Description

Numerous diagnostic and chemical assays are based on fluorescence. In this process, certain molecules emit a photon of light of one wavelength after absorbing light of a different wavelength. Spectrometers measure the amount of the emitted light which is concentration dependent. The ITFD combines, in a single unit, two separate components commonly found in a spectrometer: a wavelength filter system and a detector. The filter system consists of a corrugated metal layer constructed using thin-film and microfabrication technology. The periodicity of the corrugations corresponds to the desired emission wavelength. The stack sits on top of an integrated circuit optical detector.



Schematic of integrated thin-film fluorescence sensor.

## Options for Commercialization

This technology opportunity is part of the NASA Technology Transfer Program. The program seeks to stimulate development of commercial applications from NASA-derived technology. United States Patent No. 5,841,143 covering this technology was issued November 24, 1998. A proof-of-concept of the wavelength filtering system has been demonstrated. Significant additional development and research are needed to optimize and further refine the properties for academic or commercial applications.

If your company is interested in the ITFD technology, or if you desire additional information about working with NASA on this or other sensor-related problems, please contact the Commercial Technology Office.

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## References

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- Margaret Tuma and Russell Gruhlke: Integrated Thin-Film Fluorescence NO<sub>x</sub> Sensor: Preliminary Measurements," AIAA-98-3613, AIAA Joint Proplulsion Conference, 1998.
- Russell Gruhlke, Margaret Tuma, Kristie Elam, and Dak Knight: Thin-Film Optical NO<sub>x</sub> Sensor. 30th Central Regional Meeting, American Chemical Society, Paper 54, 1998.
- Margaret Tuma and Russell Gruhlke: Integrated Thin-Film Fluorescence Sensor: Concept. NASA Tech Briefs, vol. 22, no. 1, 1998 pp. 40-42.
- Margaret Tuma, Russell Gruhlke, and Thomas Brown: Evidence of Enhanced Fluorescence Via Cross Coupling in an Integrated Thin-Film Fluorescence Sensor. SPIE Proceeding, Conference on Optical Diagnostics for Fluids/Heat/Combustion and Photomechanics for Solids, vol. 3783, 1999, pp. 339-346.

## Key Words

Fluorescence detection  
Surface plasmon cross coupling  
Environmental monitoring  
Thin-film technology  
FluorChip  
Bioanalysis  
Immunoassay