TECHBRIEF

METAL-ORGANIC FRAMEWORK FILMS FOR GAS SENSOR APPLICATIONS

OPPORTUNITY:

This invention describes a system and method for rapid, ambient-temperature growth of metal-organic framework (MOF) films for gas sensor applications. More specifically, the invention relates to growth of MOF films on advanced sensor devices such as distributed optical fiber and passive wireless like surface acoustic wave-based sensors. This technology is available for licensing and/or further collaborative research from the U.S. Department of Energy's National Energy Technology Laboratory.

CHALLENGE:

MOF thin films have emerged as particularly attractive candidates for gas sensing applications due to their tunable porosity and pore size, enabling them to be rationally designed to selectively absorb specific gasses of interest. MOFs are especially appealing due to their high selectivity and capacity for energy-relevant gasses such as carbon dioxide and methane. A critical step towards the development of MOF thin film devices is the ability to efficiently and reliably incorporate high-quality MOF layers onto a wide range of substrates like optical fibers. However, current techniques are often inconvenient due to long reaction times, heating requirements, equipment costs and/or poor control over crystal coverage and morphology.

OVERVIEW:

NETL researchers have developed a tunable, selective and rapid method to produce MOF films at room temperature that are applicable to a variety of substrates, including optical fibers. The NETL method uses the conductive metal oxide itself as a template for MOF growth by sequential exposure to the metal cation and the organic linker at ambient conditions. Because MOF growth only occurs on the metal oxide, waste form side reactions will be mitigated, providing a more environmentally friendly process compared to conventional techniques. This method is also applicable to any substrate that is amenable to conductive metal oxide deposition, making it ideal for advanced sensor devices such as distributed optical fiber and passive wireless such as surface acoustic wave-based sensors.

(continued)

ADVANTAGES:

- Versatile and cost-effective.
- Rapid, tunable and selective.
- More environmentally friendly than conventional methods.
- Avoids tedious layer-by layer deposition methods.
- Applicable to a wide variety of substrates.

APPLICATIONS:

- Gas Sensors.

PATENT STATUS:

U.S. Patent Pending (non-provisional patent application)

Filed: 03/28/2019

Title: Growth and Optimization of Metal-Organic Framework Thin Films on a Conductive Metal Oxide for Gas Sensor Applications

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NETL Reference No: 18N-15

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