Licensable Technologies

Intelligent Coatings for Location And Detection of leaks (IntelliCLAD)

Applications:

- Reactive paints for garages, storage facilities, restrooms, manufacturing plants, etc.
- Hydrogen fuel cells and storage containers
- Personal, wearable, economical gas detectors
- Hydrogen-enabled electronic devices

Benefits:

- Cheap
- Gases need not be contaminated with odorants
- Leaks can be visually confirmed via color change
- Allows safer handling of hydrogen or other gasses without altering chemical composition
- Enables proprietary formulation of coating materials

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Summary:

A number of industrially-useful gases can be toxic or hazardous to humans in sufficient concentrations. However, many important gases also happen to be odorless, thereby eliminating one of the most perceptive human faculties—the sense of smell—from alerting people of the impending danger of a gas leak. Ever since the tragic natural gas explosion of 1937 in a New London, Texas school building, various governments have mandated that odorants be added to natural gas local distribution systems to alert individuals of its presence. The pungent odor of mercaptan, for example, makes any natural gas leak readily detectable by humans.

An exaggerated representation of the IntelliCLAD coating in action. A breach in the coating produces a color change at the point of failure along with a corresponding dispersal of odorant material.

Nevertheless, there remain several applications in which typical methods for odorizing gases simply will not suffice. Hydrogen gas, for example, could potentially supplant widespread use of hydrocarbon-based fuels in what has been dubbed the "hydrogen economy," but odorization of hydrogen will not make a leak noticeable to humans if the odorant quickly rises above "nose height" along with the rest of the hydrogen gas. Compounding the problem is the fact that almost all commercial odorants contain sulfur, which poisons the catalysts used in hydrogen-based fuel cells. This calls for a novel approach to odor-based detection of hazardous gases.
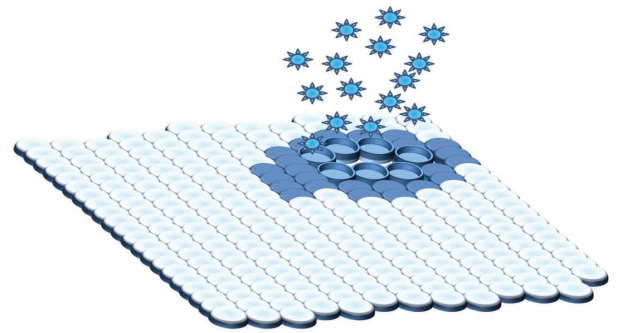
In response to this need, Los Alamos National Laboratory (LANL) researchers have developed Intelligent Coatings for Location And Detection of leaks (IntelliCLAD), a new class of smart coatings that are non-odorous, but which release an odor in the presence of selected gases of concern. IntelliCLAD storage tanks and pipes alert people with a powerful and alarming odor in the vicinity of the leak, allowing people to respond by evacuating the area. IntelliCLAD containers also react to leaks by changing color in the presence of the selected gas, allowing rapid and targeted remediation of the failure.

IntelliCLAD eliminates the need to introduce odor contaminants to gases, while still allowing for a low detectability threshold. This provides a new level of freedom to design devices utilizing these gases. Coatings may even be designed to release pleasant odors in the presence of disagreeable ones. An employee badge with IntelliCLAD shielding could provide a personal level of security that was economically infeasible until now. From fad jewelry, to paint, to large-scale industrial implementation, the possibilities for IntelliCLAD are nearly endless. Odor release can be combined with color change to not only detect a leak, but also determine its location.

Development Stage: A hydrogen-sensitive IntelliCLAD coating has been reduced to practice. The IntelliCLAD concept is applicable to a myriad of substances of concern, depending on the desired application.

Patent Status: U.S. Patent 7,915,047

Licensing Status: Hydrogen-sensitive IntelliCLAD technology is available for exclusive or non-exclusive licensing. Development of IntelliCLAD coatings tuned for use with specific gases of concern may be achieved by means of a Cooperative Research and Development Agreement (CRADA).

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