Pacific Northwest NATIONAL LABORATORY

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Battelle Number(s):

11616

Patent(s) Issued

Available for licensing in all fields

Available Technologies

Hydrogen Bonding Hybrid Organic/Inorganic Copolymers for Acoustic Wave Sensors and Arrays

SUMMARY

Novel hydrogen bonding organic/inorganic copolymers have been synthesized and used in surface acoustic wave (SAW) sensors. The response to nerve agent simulants and organic solvents reaches 90% of full response within 6 seconds of the first indication of response. In tests with actual nerve agents, response sensitivity was increased at least four times over other typically used sensing polymers. This polymer is presently being used in commercially available chemical sensors, and has shown potential usefulness as an optical fiber coating.

These rationally designed, hydrogen bonding hybrid organic/inorganic polymers have been prepared incorporating fluoroalkyl-substituted bisphenol groups linked using oligosiloxane spacers. These hydrogen-bond acidic materials have glass-to-rubber transition temperatures below room temperature and are excellent sorbents for basic vapors. The physical properties such as viscosity and refractive index can be tuned by varying the length of the oligosiloxane spacers and the molecular weight. In addition, the materials are easily cross-linked to yield solid elastomers.

It has been demonstrated that one of these materials with suitable viscosity and refractive index can be used to clad silica optical fibers; the cladding was applied to freshly drawn fiber using a fiber drawing tower. These fibers have potential as evanescent wave optical fiber sensors.

These copolymers are fully developed and in use in commercially available chemical sensors for the detection of nerve agents. PNNL seeks additional non-exclusive licensees. Details have been published:

"Hydrogen Bond Acidic Polymers for Surface Acoustic Wave Vapor Sensors and Arrays", J.W. Grate et al., Anal. Chem. 1999, 71, 1033-1040.

"Hybrid Organic/Inorganic Copolymers with Strongly Hydrogen-Bond Acidic properties for Acoustic Wave and Optical Sensors", J.W. Grate et al., Chem. Mater. 1997, 9, 1201-1207.

"Carbosiloxane Polymers for Sensors" J.W. Grate et al., Chemical Innovation, November 2000, Vol. 30, No. 11, 29-37.

"Acoustic Wave Microsensor Arrays for Vapor Sensing", J.W. Grate, Chem. Rev., 2000, 100, 2627.

U.S. DEPARTMENT OF ENERGY

Patents & Intellectual Property

» Patent #: 6,015,869

Technology Portfolio(s)

» Other

» Chemical Sensors

Potential Industry Applications

» Computers & Electronics

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