dressed to the Patent Counsel, Johnson Space Center, (281) 483-0837. Refer to MSC-23933-1.

This work was done by Betsy Pugel of Goddard Space Flight Center. Further information is contained in a TSP (see page 1).GSC-15338-1

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Refer to NPO-44997, volume and number of this NASA Tech Briefs *issue, and the page number.*

Non-Destructive Evaluation of Materials via Ultraviolet Spectroscopy

A document discusses the use of ultraviolet spectroscopy and imaging for the non-destructive evaluation of the degree of cure, aging, and other properties of resin-based composite materials. This method can be used in air, and is portable for field use. This method operates in reflectance, absorbance, and luminescence modes.

The ultraviolet source is used to illuminate a composite surface of interest. In reflectance mode, the reflected response is acquired via the imaging system or via the spectrometer. The spectra are analyzed for organic compounds (conjugated organics) and inorganic compounds (semiconducting band-edge states; luminescing defect states such as silicates, used as adhesives for composite aerospace applications; and metal oxides commonly used as thermal coating paints on a wide range of spacecraft). The spectra are compared with a database for variation in conjugation, substitution, or length of molecule (in the case of organics) or band edge position (in the case of inorganics).

This approach is useful in the understanding of material quality. It lacks the precision in defining the exact chemical structure that is found in other materials analysis techniques, but it is advantageous over methods such as nuclear magnetic resonance, infrared spectroscopy, and chromatography in that it can be used in the field to assess significant changes in chemical structure that may be linked to concerns associated with weaknesses or variations in structural integrity, without disassembly of or destruction to the structure of interest.

Gold-on-Polymer-Based Sensing Films for Detection of Organic and Inorganic Analytes in the Air

A document discusses gold-on-polymer as one of the novel sensor types developed for part of the sensor development task. Standard polymer-carbon composite sensors used in the JPL Electronic Nose (ENose) have been modified by evaporating 15 nm of metallic gold on the surface. These sensors have been shown to respond to alcohols, aromatics, ammonia, sulfur dioxide, and elemental mercury in the parts-per-million and parts-per-billion concentration ranges in humidified air.

The results have shown good sensitivity of these films operating under mild conditions (operating temperatures 23–28 °C and regeneration temperature up to 40 °C). This unique sensor combines the diversity of polymer sensors for chemical sensing with their response to a wide variety of analytes with the specificity of a gold sensor that shows strong reaction/binding with selected analyte types, such as mercury or sulfur.

This work was done by Kenneth Manatt of Santa Barbara Research and Margie Homer, Margaret Ryan, Adam Kisor, Abhijit Shevade, April Jewell, and Hanying Zhou of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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Pasadena, CA 91109-8099

Quantum-Inspired Maximizer

A report discusses an algorithm for a new kind of dynamics based on a quantum-classical hybrid-quantum-inspired maximizer. The model is represented by a modified Madelung equation in which the quantum potential is replaced by different, specially chosen "computational" potential. As a result, the dynamics attains both quantum and classical properties: it preserves superposition and entanglement of random solutions, while allowing one to measure its state variables, using classical methods. Such optimal combination of characteristics is a perfect match for quantum-inspired computing. As an application, an algorithm for global maximum of an arbitrary integrable function is proposed. The idea of the proposed algorithm is very simple: based upon the Quantum-inspired Maximizer (QIM), introduce a positive function to be maximized as the probability density to which the solution is attracted. Then the larger value of this function will have the higher probability to appear.

Special attention is paid to simulation of integer programming and NP-complete problems. It is demonstrated that the problem of global maximum of an integrable function can be found in polynomial time by using the proposed quantum-classical hybrid. The result is extended to a constrained maximum with applications to integer programming and TSP (Traveling Salesman Problem).

This work was done by Michail Zak of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).
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