ABSTRACT

Reproducibility of Responses in Polymer-Carbon Composite Films in an Electronic Nose Sensing Array

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An electronic nose is a sensing system which uses an array of weakly specific sensors to develop a pattern of response which corresponds to changes in the environment. By using a pattern-matching approach to data analysis, compounds causing change in the environment can be identified and quantified if the pattern has been previously recorded. An electronic nose which uses an array of polymer-carbon composite sensors is under development at the Jet Propulsion Laboratory, with future use planned as an event monitor for human habitats in spacecraft. This monitor, the JPL ENose, is being developed with an objective of the ability to identify and quantify 20-30 different compounds at the 24 hour Spacecraft Maximum Allowable Concentration (SMAC) for each compound.

In order for this device to be useful as an event monitor, the sensors in the array must show repeatable response to a stimulus. For any software which is developed to identify and quantify changes, sensing films must be made reproducibly. That is, two sensors made identically should have identical response, and the response of a sensor to a repeated stimulus should be the same each time.

The sensing media used in the JPL Electronic Nose are films made from polymers with carbon dispersed through the film. The baseline resistance of these films ranges from one to several hundred kΩ, depending on the carbon load, the film thickness, and the polymer identity. The work on making reproducible films focuses on making homogeneous solutions which will result in a homogeneous dispersion of carbon in the film, and on developing processing techniques which ensure that each film dries with the polymer left in a similar geometry.

This talk will discuss approaches to developing reproducible films with repeatable response, and discuss the lifetime of a sensing array based on the time sensors will retain characteristics allowing repeatable, reproducible responses.

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