

II. Sensor & System Applications

(B) Sensitivity and Discrimination Enhancement Mechanisms and Principles

Co-Chairs: **James Jensen, U.S. ECBC, jim.jensen@us.army.mil**
Laszlo Kish, Texas A&M University, Laszlo.Kish@ece.tamu.edu

Sensors built of nanophase materials and nanostructures often show superior sensitivity to certain agents. However, agent discrimination, long-term stability, false and missed alarm probabilities can be problematic. The sensitivity and the agent discrimination ability (selectivity) of sensors can be improved by using specific principles, materials, structures and signal analysis. Specific doping and coating, utilizing grain boundary phenomena, Mie-scattering, optical lattices, fluctuation-enhanced sensing and higher-order statistical tools are relevant examples among the many. Choosing proper sensor feature size, biasing, frequency range, pattern generation and recognition tools, etc, are essential for gaining the maximal information by sensing. The ultimate questions are the probabilities of false and missed alarms during a wide spectrum of agents and a wide range of concentrations. This session focuses on the issues described above including relevant solutions and their implications. Among others, the following topics are of interest: New principles, materials and structures to enhance sensitivity and selectivity; Reproducibility; Optimal sensor size or characteristic feature size; Detecting a wide range of concentrations; Detecting a wide spectrum of agents; Time requirement versus the number of different agents to discriminate; Time requirement versus sensitivity; False and missed alarm probabilities versus sampling time window at given sensitivity and selectivity; Long-term stability; Electronic noses with small number of sensors for large number of different agents; Advanced methods to extract more information from a single sensor, such as fluctuation-enhanced sensing, transient analysis, etc.