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L. Peter Martin, Leta Y. Woo, Robert S. Glass

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L. Peter Martin, Leta Y. Woo, and Robert S. Glass

Lawrence Livermore National Laboratory
University of California
Livermore, California, USA 94550

An impedancemetric technique for NO_x sensing using a yttria-stabilized zirconia (YSZ) electrochemical cell is reported. The cell consists of a dense YSZ substrate disk with two YSZ/metal-oxide electrodes deposited on the same side. The cell is completely exposed to the test gas (no air reference). The NO_x and O_2 response of the cell were evaluated during constant-frequency operation at frequencies in the range from 1 to 1000 Hz. At 10 Hz, the NO_x response (as measured by phase angle shift) is shown to be linear with concentration over the range from 8-50 ppm, with comparable response to both NO and NO_2. A method of operation is described which enables compensation for the O_2 response at oxygen concentrations greater than approximately 4%. This mode of operation allows the sensor to provide sub-10 ppm detection of NO_x irrespective of the O_2 concentration. The sensor exhibits good stability during continuous operation for more than 150 hr. It was observed that the O_2 response of the cell is too slow to be of practical use, taking several minutes to equilibrate after changing the concentration by a few percent. However, data will be presented which demonstrate that this response is related to the metal oxide used for the electrode; and more rapid response times can be achieved by modification of the electrode material.

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