

## **Possibilities of Gas Sensors Improvements and Control via Transient Mode Processing**

Alexander Shapurko,<sup>1</sup> Richard Soltis<sup>2</sup> and Ken Nietering<sup>2</sup>

<sup>1</sup>Institute of Mechanical Engineering Problems  
61, Bolshoy pr. V.O.  
St-Petersburg 199178  
Russia

<sup>2</sup>Ford Motor Company  
MD3028/SRL  
Dearborn, MI 48121-2053  
USA

Sensor application of Transient Mode Processing Technique (TMPT) has been developed for identification of limiting factors of mass transport process in gas sensors.

Based on an idea that under transient conditions the slowest stage has to become a “bottleneck” for general mass transport process in particular electrochemical device, we obtained the solution in form of approximation for sensor signal function, which clearly reflects relationship between the function and rate-limiting stage parameters under transient condition via relaxation time of the sensor .

This approach allows obtaining basic information for optimization of sensors construction (by tuning of each stage parameters in mass transport chain within range when relaxation time of the stage remain lower than that of critical stage via changes of geometric factor related to the particular stage) , improvement (by changing of critical stage or tuning of critical stage parameters ) and control (by monitoring of changes in critical stage parameters).

Detailed applications of this technique will be shown on examples of commercially available heated exhaust gas oxygen (HEGO) sensors .