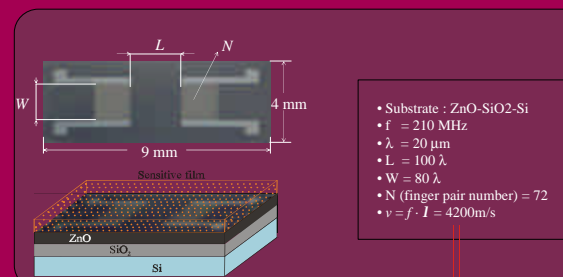


M.J. Fernández, J.L. Fontecha, I. Sayago, M. Aleixandre, J. Lozano, J. Gutiérrez, I. Gràcia\*, C. Cané\*, M.C. Horrillo,  
 Instituto de Física Aplicada, (CSIC), Serrano 144, 28006 Madrid, Spain  
 \* Centro Nacional de Microelectrónica, (IMB-CSIC), 08193 Bellaterra, Spain

## OBJECTIVE

Realization of an array composed by seven SAW sensor fabricated on a structure ZnO-SiO<sub>2</sub>-Si and coated with diverse polymers in order to detect and discriminate low concentrations of three different volatile organic compounds (VOCs) by means of linear techniques as principal component analysis (PCA) and non linear ones as probabilistic neural networks (PNN). Prediction of gas concentration has been made using Partial Least Squares (PLS) analysis.

## SAW sensor characteristics



## SAW sensor array characteristics

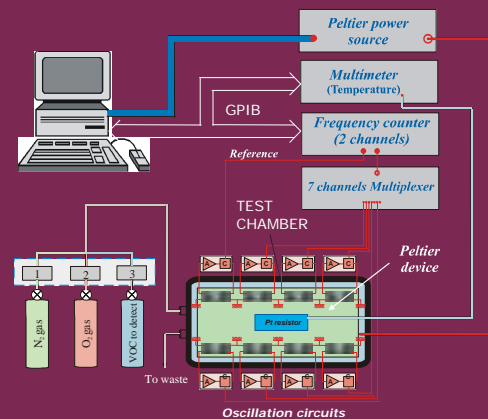
### Test chamber and oscillation circuits



### SAW array composition

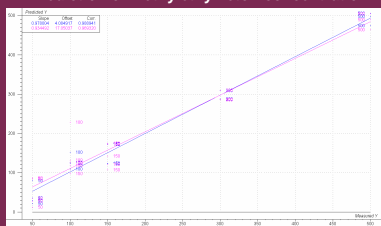
Sensor	Polymer	Frequency shift (kHz)	Losses (dB)
0 (Reference)	--	--	--
1	OV-275	300	9.0
2	PIB	300	4.5
3	PEUT	200	0.9
4	OV-225	300	5.8
5	PEUT	300	1.5
6	PECH	300	4.5
7	PECH	435	0.4

## Experimental set-up of the whole SAW sensor system

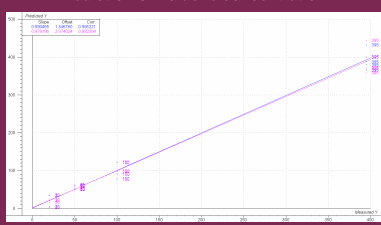


## PLS ANALYSIS

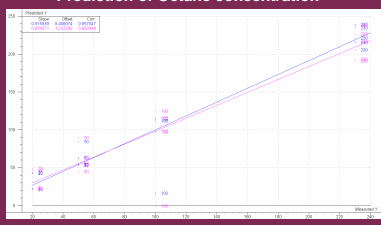
### Prediction of Methylethylketon concentration



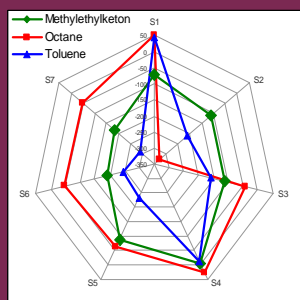
### Prediction of Toluene concentration



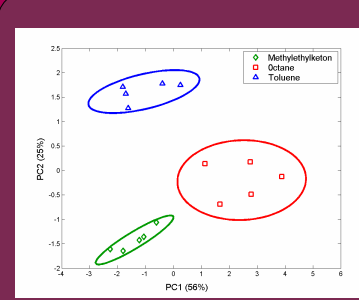
### Prediction of Octane concentration



## Sensor response to 100 ppm of each gas



## PCA plot of responses to 50 ppm of each gas



## CONCLUSIONS

- By first time an electronic nose composed by 8 SAW sensors with ZnO-SiO<sub>2</sub>-Si structure has been developed with this technology in order to detect VOCs
- By means PCA has been possible to discriminate low concentrations of the three gases, obtaining through a PNN a success rate of 100%
- In the prediction of gas concentration with Partial Least Squares (PLS) analysis correlation coefficients near 1 have been obtained