

TITLE: A new approach for natural gas applications by means of a MEMS-based GC: the picoGC project

*B. Vazquez Iglesias, S. Rizzi, M. Monticelli,
Pollution Analytical Equipment S.r.l.
Via Guizzardi 52, 40054 Budrio (BO) - Italy*

*I. Elmi, G.C. Cardinali, S. Zampolli, F. Mancarella, F. Bonafè, F. Tamarri
Institute for Microelectronics and Microsystems, CNR-IMM
Via Gobetti 101, 40129, Bologna - Italy*

*S. Galli, M. Galli
MEGA S.r.l. - Capillary Columns Laboratory
Via Plinio 29, 20025 Legnano (MI) – Italy*

3 keywords: Gas-chromatography, lab-on-a-chip, natural gas

Gas chromatography (GC) is one of the most efficient and versatile analytical techniques for separation and identification of complex volatile mixtures [1-3]. However, for natural gas applications, sensitivity, low gas/energy consumption, linearity and short response times are extremely important and traditional GC systems does not meet all these requirements. Many efforts have been made in the last decades to miniaturize this technology to develop high-performance microGC (μ GC) [4-5]. Nevertheless, the microfabricated analytical core integration inside a GC instrument is extremely challenging. To date, only a few μ GC are successfully available in the market, however these are bulky, expensive and do not fulfil all market needs. To overcome these limits, a highly technological lab-on-a-chip (LOC) system for GC analyses fully based on Micro-Electro-Mechanical Systems (MEMS) is proposed. Preliminary results are obtained for natural gas heating value measurements with an isothermal configuration. Sampling frequency is tuned up to 1 kHz, allowing extremely fast data acquisition rate. The analysis time is below 5 minutes, and the use of MEMS devices allow to significantly reduce the carrier gas flow and the energy consumption in comparison with current cutting-edge μ GC already available on the market. These results confirm that this is the most promising and cost-effective technology for natural gas analyses for the next years.



Pollution S.r.l.

Via Guizzardi, 52 - 40054 Budrio (Bologna) - Italy
Tel +39 051 6931840 - pollution@pollution.it
P.IVA 00694631201 - C.F. 04051900373 - N° R.E.A. 335338



- [1] F.L.Dorman, J.J. Whiting, J.W. Cochran, J.Garrea-Torresdey, Gas Chromatography, Anal. Chem., 2010, 82 (12), pp 4775–4785
- [2] L. S. Ettre and J. V. Hinshaw, Basic Relationships of Gas Chromatography, Advanstar, Cleveland, OH, 1993, pp. 36–43.
- [3] R.L. Grob, E.F. Barry, Modern Practice of Gas Chromatography, 2004, 978-0-471-22983-4 John Wiley & Sons, Inc.
- [4] M. Agah, G.R. Lambertus, R. Sacks, and K. Wise, High-Speed MEMS-Based Gas Chromatography, J. Microelectromech. Syst., 15, 2006, pp.1371-1378
- [5] S. Narayanan, B. Alfeeli, M. Agah, A micro gas chromatography chip with an embedded non-cascade thermal conductivity detector, Procedia Engineering 5, 2010, pp 29-32