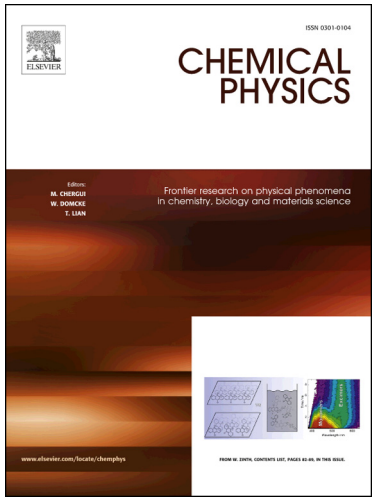

NMT – a new individual ion counting method: comparison to a Faraday cup

Michael Burton, Boris Gorbunov

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NMT – a new individual ion counting method: comparison to a Faraday cup

Michael Burton and Boris Gorbunov

Ancon Technologies Limited, CIC, University Road, Canterbury, Kent CT2 7FG, UK

Corresponding author: M. Burton michael.burton@ancontechnologies.com

Abstract

Two sample detectors used to analyze the emission from Gas Chromatography (GC) columns are the Flame Ionization Detector (FID) and the Electron Capture Detector (ECD). Both of these detectors involve ionization of the sample molecules and then measuring electric current in the gas using a Faraday cup.

In this paper a newly discovered method of ion counting, Nanotechnology Molecular Tagging (NMT) is tested as a replacement to the Faraday cup in GCs. In this method the effective physical volume of individual molecules is enlarged up to 1 billion times enabling them to be detected by an optical particle counter.

It was found that the sensitivity of NMT was considerably greater than the Faraday cup. The background in the NMT was circa 200 ions per cm^3, corresponding to an extremely low electric current ~10^{-17} A.

Keywords: ultra-low electric current, trace gas sensing, ion counting, gas chromatography, ion detection.

Introduction

Detection of ions in the gas phase is widely employed in science and technology, e.g. in trace gas detectors such as Ion Mobility Spectrometry (IMS), Mass Spectrometry (MS), Gas Chromatography (GC). In nuclear physics the cloud chamber detector is used [1]. The