Proceedings of the World Congress on New Technologies (NewTech 2015)
Barcelona, Spain – July 15 - 17, 2015
Paper No. 340

Determination of C_{60} Aerosol in the Atmosphere of Vitoria-Gasteiz

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Extended Abstract

Nanoparticles are produced by natural phenomena such as forest fires and volcanic eruptions as well as by many industrial processes. One of the most relevant groups of nanomaterials is carbon-based nanoparticles as the fullerenes.

An essential aspect of environmental risk assessment is the development of analytical tools which enable studying the behavior and occurrence of fullerenes in natural environmental samples at low concentrations. Most of the works dealing with the analysis of environmental samples are devoted to the determination of fullerenes at industrial effluents (1), surface soils (2) and waters (3), although recently their presence has been reported in airborne samples from Mediterranean Sea (4).

In this work a method is proposed for the determination of C_{60} fullerene in several atmospheric environments. The method involves the use of high performance liquid chromatography coupled to atmospheric pressure chemical ionization mass spectrometry (HPLC-APCI-MS) and DAD spectroscopy. The analytical method limit of detection (LoD) and limit of quantification (LoQ) is 0,4 and 2,0 ng/ml respectively for the analytical solutions.

The samples are obtained at 4 points located in Vitoria-Gasteiz: i) a residential area, ii) an area with large amount of traffic, iii) a highly industrialized urban area and iv) a parking garage of the university (172 parking spaces) with a relatively steady stream of traffic during the days with classes cycle at the University. In addition, samples from the soot from exhaust pipes of lawn mowers and of diesel and gasoline cars with and without catalytic converters have been analyzed.

The C_{60} fullerene recovery of the toluene extraction process is tested with fortified blank filters and is highly reproducible. In all cases, extraction recoveries range from 97,0 to 99,2%.In the toluene extraction process of environmental matrices the extraction recoveries range from 50,0 to 55,9%.

The average of C_{60} fullerenes aerosol phase concentrations are under 1 pg/m^3 for urban areas. The medium concentration of C_{60} fullerenes in the parking garage is 3 pg/m^3. C_{60} fullerene was not detected in any sample of cars with catalytic converters. However, C_{60} fullerene concentrations in the soot from exhaust pipes of lawn mowers and cars without catalytic converters are 102 and 103 pg/m^3 respectively.

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