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Contamination tests of metal and non-metal elements from packaging materials to food gases

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This study presents the results of different tests carried out to evaluate the possible contamination of food gas due to contact with different materials used for gas storage and distribution, including carbon steel cylinders and tanks, as well as copper pipes. A specific procedure for sampling and analysis of up to 26 metal and non-metal elements, was defined and tested on: (i) CO_2 stored in a ~45 m long copper pipe, (ii) CO_2, N_2 and O_2 stored within 36 carbon steel cylinders of different inner volume, and (iii) CO_2 stored in 20 tanks constituted of different steel types (e.g. CRYALSIM, SELCO 52 LT FALK). After a storage period, the gases were transferred to a trap i.e., dewars equipped with gas bubble diffusers and filled with 100 mL of a 1% HNO_3 solution in Milli-Q water. The analysis was carried out by ICP-AES and ICP-MS. Although no reference values indicating the concentration limits of metal/metalloid contaminants in food gases are currently promulgated, the effective contamination level of the elements that were systematically detected in the CO_2 samples (Al, Cr, Cu, Fe, Ni, and Zn) was estimated by considering the limit concentrations for mineral waters for human consumption (European Directive 98/83/EC). Such a comparison showed that the contaminant concentrations were 3 to 6 orders of magnitude lower than the Limit Concentrations (LCs). This implies that the amount of contaminants that could be possibly related to the contact of CO_2 with the selected packaging materials was negligible.

Biography

Francesco Capecchiacci has graduated in Geological Sciences at the University of Florence, where he also completed the PhD in Earth Sciences. He currently works at the Department of Earth Sciences of the University of Florence as post doc research fellow and is also associated to National Research Council (CNR)-Institute of Geosciences and Earth Resources (IGG) section of Florence. He has a long experience in the field of fluid geochemistry and in particular for all those aspects concerning the knowledge, practice and develop of sampling and analytical methods for water and gas in natural environments (in particular volcanic and geothermal) and anthropized systems (landfills and industrial areas). Work experience in national and international projects at Department of Earth Sciences - University of Florence and CNR-IGG of Florence.

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