Synthesis of the methyl iodine labeled with radioiodine to detect leaks in heat exchangers.

V. P. Araujo[1]; I. C. Taam[2]; A. V. Nobrega[2] , A. A. Mazzei[3], L. E. B. Brandão[1]
E-mail: valeska@ien.gov.br; armi.nobrega@incqs.fiocruz.br; isabel.taam@atomum.com.br, brandao@ien.gov.br

[1] *IEN/CNEN*
[2] *Atomum Serviços Tecnologicos Ltda.*
[3] *Fundação Oswaldo Cruz/ FIOCRUZ*

Keywords: radiotracer, iodomethane, leak detection, heat exchangers.

The online detection of leaks in industrial heat exchangers is one of the most used industrial radiotracer techniques. To locate leaks in a heater exchange located in oil and gas offshore platforms, the radiotracer must have a half-life large enough to allow its transport from the supplier to the offshore platform and a gamma energy high enough to cross the walls of the industrial unity. Because CH_3I labeled with radioiodine satisfies these conditions, it was selected as the radiotracer to be used to locate leaks in high-pressure heat exchangers in oil and gas offshore platforms. [1,2,3] In a new apparatus, shown in Figure 1, the methyl iodine radiotracer is produced by reacting dimethyl sulfate with NaI^{123} [4,5]. It is a conventional Soxhlet extractor and was modified to guarantee safe operations with radioactive isotopes.

Figure 1. New synthesis apparatus for production of the radiotracer CH_3I labeled with radioiodine.

The stoichiometric and temperature parameters were optimized to obtain the best reaction yield and the CH3I was synthesized in a liquid phase with a high chemical purity.

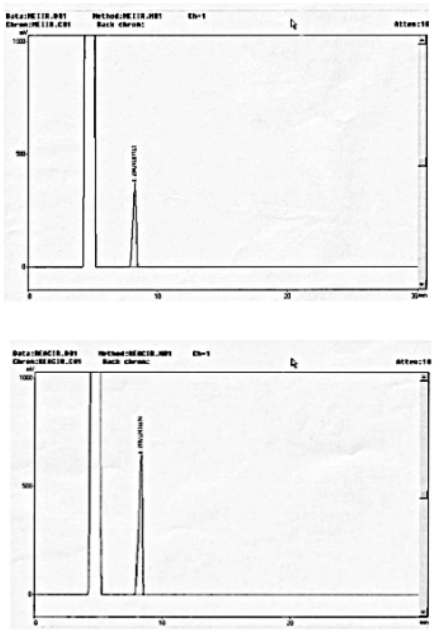

Figure 2. Control of chemical purity by high-pressure liquid chromatography with detection by refractive index. HPLC- IR

Figure 2 shows the results of the gaseous chromatography analysis for the methyl iodine: the first chromatogram is the reference standard, and the second one is the methyl iodine produced in the new synthesis apparatus. The chromatogram analysis proves that the product obtained in the synthesis was pure CH_3I, without any trace of another organic or inorganic compound, and it is free of traces of HI, water, or other impurities.

References

[1] KING, C. S.; HARTMAN, W. W. Methyl Iodide, Organic Syntheses.; Collective Volume, 2, p. 399(1943).
[2] DUMAS AND PELIGOT, Ann. de Chim. et de Phys. 15, 20 (1835).
[3] RT-IEN-04, Relatório Técnico IEN/CNEN-04, 2010 Unidade de Produção de Traçador Radioativo Gasoso, Rio de Janeiro.
[4] RT-IEN-06, Relatório Técnico IEN/CNEN-06, 2010 Produção de Traçador Radioativo I2 e CH3I Marcados com 123I, Rio de Janeiro.