Improvement of chemical procedures for effective ^{32}P and ^{35}S analyses in radioisotope wastes

Sang Ho Lim[1] , Dong Je Lee[2], Se Chul Sohn[1], Jin Ko[3], Yong-Ku Choi[2], Hong Joo Ahn[1]

[1,] *Korea Atomic Energy Research Institute, 111 Daedeok-daero 989 beon-gil, Yuseong-gu, Daejeon, 34057, Korea*

slim@kaeri.re.kr

[2]*Sunkwang T&S, 2001-ho, 3, Gongwon-ro, Guro-gu, Seoul, , 08298, Korea*

[3]*Korea Radioactive waste agency, 89 Bukseong-ro, Gyeongju-si, Gyeongsangbuk-do, Republic of Korea*

In recent years, the use of ^{32}P and ^{35}S lable biomolecules have been rapidly increasing in the medical purposes such as in vivo test, gauges, radiation diagnosis and teletherapy, and the demand for the chemical analysis for ^{32}P and ^{35}S in RI wastes is also increasing. Both nuclides are pure beta-emitter with a very short half-life of 14.3 and 87 day for ^{32}P and ^{35}S, respectively. Therefore, appropriate chemical procedures with high recovery yields in a relatively short period of time is required for the chemical analysis of each nuclide.

In general, the chemical procedures for both nuclides can be divided into a chemical leaching step and a chemical separation step. The leaching process is carried out without distinction of the two nuclides in the presence of hot nitric or hydrochloric acids. In the chemical separation step with the solution obtained from the leaching process, the chemical separation is carried out separately by the liquid-liquid extraction and the precipitation method for ^{32}P and ^{35}S, respectively. The total activity of the separated ^{32}P and ^{35}S are determined by liquid scintillation counter (LSC) and gas propotional counter (GPC)

In this study, more space-saving and simple chemical leaching process, namely ‘pressurized leaching method’ using Teflon digestion vessel was introduced to reduce chemical process times and the amounts of chemical wastes during the chemical leaching steps in comparison with the conventional method. In addition, the solution obtained from the chemical leaching step often contains other RI species (mainly ^{3}H and ^{14}C). These species with relatively high concentration compared to ^{32}P may lead to interfere with accurate ^{32}P measurement. Herein, we also present improved chemical treatments to avoid interfering effects.