Development of $^{82}$Sr/$^{82}$Rb generator system for medical applications

Yeong Su Ha$^1$, Minjung Kwon$^1$, Sang-Pil Yoon$^1$, Yong-Sub Cho$^1$ and Kye-Ryung Kim$^1$

$^1$Korea Multi-purpose Accelerator Complex, Korea Atomic Energy Research Institute, Gyeongju, Republic of Korea

*E-mail: ysha19840704@kaeri.re.kr

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Nuclear imaging is one of the most powerful means available for non-invasive diagnosis of myocardial disease. Several radioisotopes are available for myocardial perfusion imaging. The most validated radioisotopes for the measurement of cardiac blood flow are: $^{15}$N, $^{15}$O, $^{99m}$Tc, $^{201}$Tl and $^{82}$Rb. Among these radioisotopes, $^{82}$Rb and $^{99m}$Tc can be conveniently obtained from a generator system. Especially, not only $^{82}$Rb as a positron emitter allows the full advantages of positron emission tomography (PET) such as image quantification with superior sensitivity, but also several reports have shown superior diagnostic performances of $^{82}$Rb-PET as compared to conventional $^{99m}$Tc-single photon emission computed tomography (SPECT). Up to the present, since no history of the use of $^{82}$Rb radioisotope for research or medical purpose in Korea, Korea Atomic Energy Research Institute (KAERI) has plan to develop and supply $^{82}$Sr/$^{82}$Rb generator system. Therefore, we optimized $^{82}$Sr purification procedure to produce certain purity of parent $^{82}$Sr radioisotope and developed $^{82}$Sr/$^{82}$Rb generator including inlet, outlet, ion exchange column, and a thick shielding. A half dozen studies were performed to validate an optimized purification procedure. The results shows that not only superior recovery yield of Sr (96.97±1.67%) but also the low concentration of various impurities such as Rb (0.005±0.002%), Se (0.051±0.016%), Be (0.286±0.109%), and Fe (0.472±0.116%) are satisfied to meet appropriate specifications for final Sr product. Moreover, loading yields of Sr into the generator column show higher than 96% (96.36%), elution yields of Rb from the generator column show 14.4%. In future work, we plan to find satisfying elution conditions for higher elution yield in the generator system.

![Fig. 1. Results on the final yield of Sr and other impurities such as Rb, Se, Be, and Fe purified by an optimized procedure. (n = 6)](image)

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