A SEMI-AUTOMATED REMOTELY OPERATED SYSTEM FOR MANIPULATION OF RADIOACTIVE GASES*

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A remote and semi-automated system for hot cell processing of accelerator produced radioactive gases, such as $^{123}$Xe, $^{87}$Kr, and $^{211}$Rn is described. Detailed construction plans and a listing of the mechanical and electronic components are provided.

System description

Radiopharmaceutical chemists working with short-lived cyclotron produced radio-isotopes can be presented daily with handling multi-curie quantities of radioisotopes. Remote processing devices are necessary in order to reduce the radiation exposure. Semi-automated and automated control of radionuclide processing and synthetic manipulation is preferable for routine operations, in order to eliminate tedious operations and facilitate the chemist's time for research and development (see for example, References 1—7). A hot cell specifically designed for organic synthesis has been described by the Brookhaven radiopharmaceutical team.1 This note describes a system designed for the semi-automated processing of accelerator produced radioactive gases that can either be used directly or as generators of inorganic radionuclides, such as $^{123}$Xe, ($^{123}$I), $^{211}$Rn($^{211}$At) and $^{77}$Kr($^{77}$Br). The radioactive gases are transferred into a vacuum line ($10^{-6}$ pascal), received into a collection vessel, assayed with a specifically designed radioisotope calibrator and fractionated into a preselected number of receiving vessels for subsequent transport and/or radiopharmaceutical use.

Figure 1 depicts the detailed construction plan of the remotely operated radiogas handling system. The cost of components was $11,000 U. S. Figure 2 is a photograph of the stainless steel manifold 0.5” and 0.25” i.d. that was equipped with full seal.

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Fig. 1. Schematic of the processing line circuit to control it remotely

Fig. 2. Photograph of the rare gas processing line

welded Nupro air-activated valves and mounted on a 0.25" aluminum panel. Figure 3 illustrates the processing control box which is situated at an isolated position away from the processing manifold. A master-slave manipulator is not required to operate the system, but proves useful for transferring sealed ampoules from the liquid nitrogen dewar to lead shielding.