

CHAPTER 2 EXPERIMENTAL

2.1 Chemicals

1. Dowex 1x2 50-100 mesh (Cl⁻ form) Anion Resin, Fluka AG
2. Dowex 50W x 10 20-50 mesh (H⁺ form) Cation Resin, Fluka AG
3. Sodium chloride (NaCl), CARLO ERBA
4. Potassium iodide (KI), CARLO ERBA

2.2 Apparatus and Instruments

UniRad LB5320 Single Channel Analyzer for Radioisotope

Detector - NaI well-type probe EG & G BERTHOLD

Recorder - Printer (Epson LQ-570 +)

Column – It is a modified polyethylene syringe used for medicinal/clinical purposes (1, 5, 10 ml)

2.3 Site Description

Some waterways and reservoirs were selected for this study located in the map in

Figure 2.1 as follows:

- Site 1. Out let of waterworks near by the Maharaj Hospital,
- Site 2. Out let to the moat near by the Chiang Mai Ram Hospital,
- Site 3. Waterway near by the Chang Puak Hospital,
- Site 4. Mae Ping River near by the Chinda Hospital,
- Site 5. Waterway near by the Suan Prung Hospital and
- Site 6. Ang Kaew reservoir.⁽²²⁾

2.4 Standard Calibration for Single Channel γ Counter

Optimum high voltage determination for single channel γ counter was done using standard isotope, Cs-137 (Appendix 1).⁽²³⁾

2.5 Setting up Column and Flow-Through Design

Well type NaI (TI) detector was used in this work. In this case, setting up of home-made column and flow-through cell were made based on the characteristic of types of analysis, *i.e.*, batch and continuous systems.

2.5.1 Column for Batch System

Polystyrene syringe for medicinal purposes was applied directly as a column to preconcentrate the radioactive isotope from water sample (Figure 2.2).

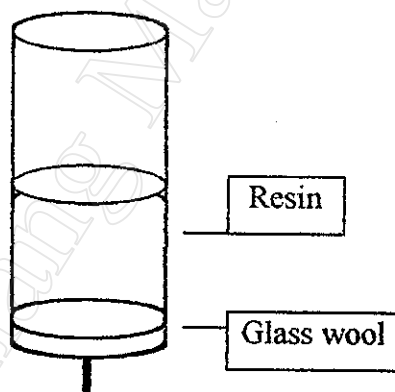


Figure 2.2 A column for pre-concentration for a batch system

2.5.2 Column and Flow-Through Design for Continuous System

Polystyrene syringe for medicinal purposes was modified as a column and flow-through cell to monitor radioactivity at the same time to preconcentrate the radioactive isotope from water sample (Figure 2.3).

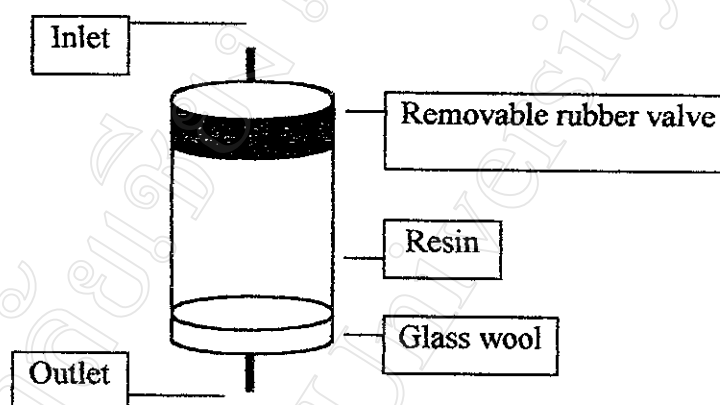


Figure 2.3 A column in a continuous system for preconcentration and used as a flow-through cell

2.6 Procedure for the Radioactivity Measurement

For the present work, both *batch* and *continuous systems* were applied. Only the continuous system was used to survey radioactivity in water of Chiang Mai Municipality.

2.6.1 Procedure for Batch System

Radioactive species in a water sample was processed for preconcentration (Figure 2.4(A)) before its measurement (Figure 2.4(B)).

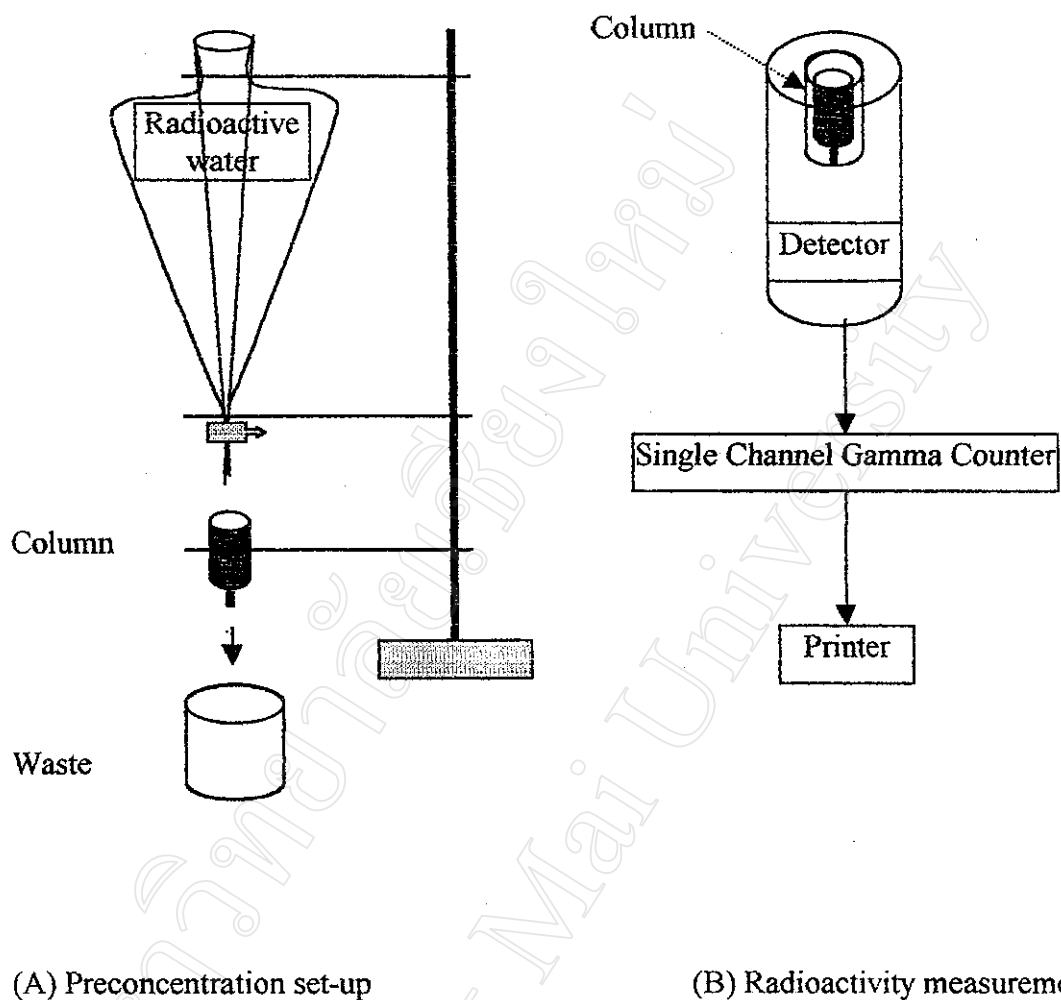


Figure 2.4 Radioactivity measuring process for batch system

Measured radioactivity was recorded and was plotted based on the recorded data using Excel program (Appendix 2).

2.6.2 Procedure for Continuous System

Radioactivity was continuously monitored directly while sample preconcentration process was in process (Figure 2.5).

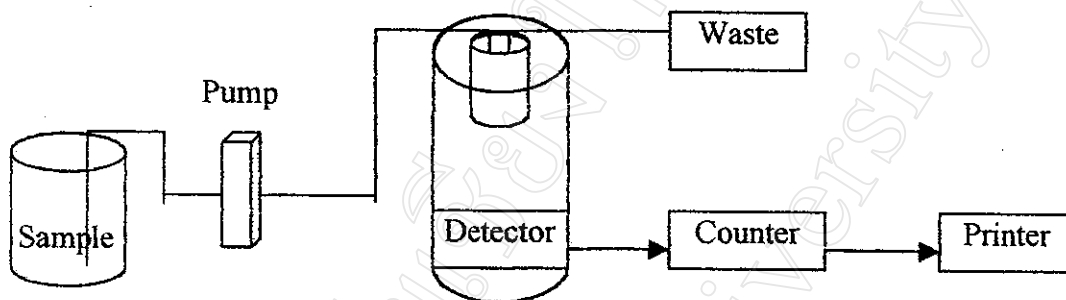


Figure 2.5 Radioactivity measuring process for continuous system

Measured radioactivity was recorded. Relationship between the activity vs. time was plotted based on the recorded data using Excel program (Appendix 3).

Sorption efficiencies of Dowex 50Wx10 and Dowex 1x2 for Cs-137 and I-131 were calculated, respectively (Appendix 4).

2.7 Effect of pH (Batch System)

Effect of pH on sorption efficiency of ion exchange resin was studied in batch system.

Results are presented and discussed in Chapter 3 (Table 3.1 and Figure 3.1).

2.8 Standard Determination for the Effect of Sample Volume

Effect of sample volume on sorption efficiency of the ion exchange resin was studied in both batch and continuous systems. Results are presented and discussed in Chapter 3 (Tables 3.2-3.4 and Figures 3.2-3.4).

2.9 Effect of Some Other Ions Which May Exist in Water Samples

Effects of some other ions that may exist in water samples were studied by using NaCl for Cs-137 and KI for I-131 as representative of ions in a water sample. Results are presented and discussed in Chapter 3 (Tables 3.5-3.7 and Figures 3.5-3.7).

2.10 Quality Control of the Experiment

Quality control was applied using tap water spiked with known activity of Cs-137 in addition to instrument calibration using a standard source (Appendix 1). Efficiency of detector was determined using standard Cs-137 (Appendix 5).

2.11 A Survey of Radioactivity in Water of Chiang Mai Municipality

Survey of radioactivity in the water samples, from the selected sites of Chiang Mai Municipality (Section 2.3 and Figure 2.1), was made. Results and discussions are presented in Chapter 3 (Table 3.11 and Figure 3.10).