

COMPARISON OF ETHYLENE GLYCOL AND SILICA GEL AS COLLECTION MEDIUM FOR TRITIUM BUBBLER

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Regarding the silica gel, the rate and quantity of gel vary with individual situations and schools of thought. In the early 1970's, the Intersociety Committee procedure described a 30 X 3.1 cm diameter cylinder filled with 180 g of silica gel sampling at 100-150 sccm. This configuration can sample for 7 to 14 days. The literature suggests this method to be better than 90% efficient for HTO and likely approaches 99% under the right conditions. The silica gel collection technique systematic errors are described as the uncertainty in the volume of air sampled, uncertainty of total volume of effluent, temperature, pressure, and relative humidity.

Regarding the bubbler and glycol, the rate and quantity of glycol may vary. However, standard practice is the use of three 20cc vials for HTO collection and three 20cc vials for HT (and T-organic) collection. Each of the vials are filled with 10ml of glycol. The bubbler draws a constant and controlled sample of 150 sccm (sample rate is not a source a systematic error as with the silica gel devices). The efficiency for HT, HTO, and T-organics is >99%. The use of three vials for each species ensures that any carry-over from the initial vial will be collected. The bubbler/glycol collection technique systematic error is the measurement of the total volume of effluent being sampled.

Another advantage of the bubbler is found in the sample preparation for liquid scintillation counting. The silica gel must be heated in a distilling flask. The distillate can then be prepared with scintillation cocktail for the counter. Losses, cross contamination, and other errors can be introduced during this procedure and significantly affect the accuracy of the measurement. Contrast this with the sampling in ethylene glycol where an aliquot of the bubbler vial is mixed with the scintillation cocktail for the counter. The vials can be measured individually or as a composite. There is generally sufficient sample ethylene glycol to conduct ten (10) duplicate analyses per vial. The ethylene glycol mitigates the need for the distillation process and therefore eliminates a number of significant sources of error.

Finally, the ethylene glycol and Ultima Gold LSC cocktail are typically no issue for disposal. The mixture of tritium, ethylene glycol, and Ultima Gold is a mixed waste (not considered hazardous). In a DOE facility, samples greater than 100,000 dpm are disposed in LSA. Less than 100,000 dpm are disposed of through a standard laboratory waste management channel.

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