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APPARATUS FOR PLATING OUT POLONIUM FOR ANALYSIS

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APPARATUS FOR PLATING OUT POLONIUM FOR ANALYSIS

Abstract

A twenty-four unit plating apparatus for the recovery of polonium from acid solutions is described. This apparatus uses simplified glass plating columns and a single electric motor to drive the twenty-four stirrers.

APPARATUS FOR PLATING OUT POLONIUM FOR ANALYSIS

Robert Baxter and DeWitt Wood

For the past several years in our laboratory the standard plating procedure for the electrochemical displacement of polonium upon silver has been that described by Fink (1). The glass columns used were unwieldy in assembly and considered not to be readily expendable. Each column was stirred by a glass rod directly attached to the chuck of a small induction type electric motor. These motors were unshielded from the rising vapors of the heated columns and required frequent maintenance. In addition, it was difficult to have the columns stirring at the same rate even when the motors and rheostats were used under new conditions. The copper water bath was large enough for only six columns and thus was a limiting factor in the analytical procedure. To compensate for the above mentioned difficulties, and to conserve time and effort of laboratory personnel, changes were gradually made, resulting in a more efficient and convenient model, which has been in use for the past year.

Description of Apparatus.

Figure 1 gives an exploded view of the arrangement of a plating column and stirrer. The plating column is an inverted eight ounce nursing bottle* with the

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* This selection was a corollary of a parallel study of factors involved in the plating of polonium by F. A. Smith and R. Della Rosa of the Radioactive Inhalation Section (2). The "Davol" brand bottle was found to have the required plastic cap dimensions, to permit easy removal of the foil after plating by pushing through the small center hold of the cap, and to have desirable shape and quality of glass.

Plating column arrangement

Figure 1

bottom removed. A thin silver disc ($1\frac{1}{2}$ inches in diameter) backed by a rubber disc ($\frac{1}{16}$ inch thick) is inserted in the plastic cap and screwed tightly to the bottle. The glass stirring rod is secured in a brass collar which is in turn fastened to a quarter inch brass shaft. Two ball bearings (O.D. $\frac{5}{8}$ inch, I.D. $\frac{1}{4}$ inch) each with a thickness of $\frac{3}{16}$ inches, are placed together on the shaft, and a double grooved aluminum pulley (groove diameter 1 inch) is tightened on the shaft to keep the bearings in contact with the brass collar. The pulley rides on the inside ring of the bearings. The entire assembly is supported by prick punching along the under side of the drilled hole ($\frac{5}{8}$ inch diameter) in the $\frac{3}{8}$ inch thick aluminum plate (Figure 2). Thus each stirrer can be easily removed from above for maintenance and decontamination of the glass rod.

The twenty-four pulleys are driven in two banks of twelve by two neoprene rubber cords powered by a variable speed fractional horsepower motor. The motor base is movable to allow for tension adjustments.

The aluminum plate supporting the stirrers and motor is hoisted evenly and easily by a double set of two wheel pulleys. Guide wires keep the set up from swinging and breaking the stirring rods.

The twenty-four plating columns are partitioned in a metal basket and placed in the heated water bath. The desired temperature of 90° C. is quickly attained and held by the use of an immersion water heater in conjunction with the built-in heating element and thermo-regulator of the commercially obtained water bath. In practice an electric fan is placed at the motor side to blow a continuous stream of air across the under side of the aluminum plate thereby preventing the accumulation of condensate above the plating columns.

The entire apparatus as now used makes it possible for a technician to analyze four times as many samples as were formerly obtained during the same time period. We recognize that there are several types of plating apparatus being used

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Figure 2
Multiple unit stirring apparatus

in other laboratories (3), but strongly feel that ours offers an appreciable saving of time and effort of laboratory personnel, an increase in the number of samples turned out, and low construction and maintenance costs.

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