The Safe and Efficient Evaporation of a Solvent from Solution

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The process of evaporating a solvent from a solution can cause problems for many students. By using a water–vacuum aspirator, backflashes of water can flood the sample tube and be detrimental to the experiment. This type of apparatus can also cause problems by drawing the solution it is evaporating back into the vacuum hose, causing the student to lose part or all of the products of their experiment. *Macroscale and Microscale Organic Experiments*, 2nd edition (*1*), suggested two techniques to dissolve solvents from a mixture. It suggested blowing a stream of air over the solution from a Pasteur pipet, or attaching a Pasteur pipet to an aspirator and drawing air over the surface of the liquid. Again, the danger of blowing air over the solution leaves the risk of splattering the solution, and drawing air over the surface of the liquid as described further endangers the products of the experiment through the risk of sucking the products up into the pipet aspirator.

In an effort to eliminate these problems, a new technique has been developed. By inverting an ordinary 200-mL vacuum flask and pulling a steady current of air from the vacuum apparatus through it, any type of small container can be placed under it, allowing the solvent to be evaporated in a steady, mistake-free manner (Fig. 1). By evaporating the solvent from the container that the products will be submitted in, no sample is lost through the process of transferring it from a vacuum flask or beaker to the final container.

An example of a situation in which this process was useful is the evaporation of two solutions. One contained fluorene and petroleum ether, and the other contained fluorenone, petroleum ether, and dichloromethane (Hammock, J.; Peters, M., unpublished student results). These solutions were evaporated to test the effectiveness of the new technique. Preliminary data show much promise. No products were lost owing to accidental backflashes, etc., and approximately three times more product was recovered. Although evaporation was slower than in an ordinary vacuum apparatus, it was much more efficient in that there was no chance to lose products of the experiment through mishaps that are possible with other procedures. Thus by using the apparatus described, the danger of ruining an experiment is greatly lessened. The risk of drawing a solution up into the aspirator and the hazard of splattering a solution and losing products are eliminated, and the risk of a backflash of water ruining the experiment is virtually abolished.

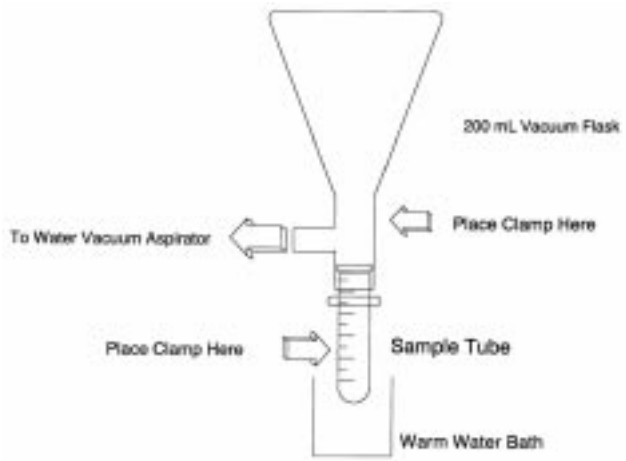

Figure 1. The evaporation apparatus.

It has also been found that gently heating the vial of products that contain the solvent being evaporated with a warm water bath and angling the entire apparatus slightly speeds up the evaporation process. Therefore, using the aforementioned procedure to evaporate a solvent can save the student time and much grief, as the process is fairly quick and greatly lessens the chance of losing important experimental products.

Literature Cited

1. Williamson, K. L. *Macroscale and Microscale Organic Experiments*, 2nd ed; D. C. Heath: Lexington, MA, 1994.

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