

Manual Microscale Column Chromatography Pressurization Apparatus

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The use of Pasteur pipets for microscale column chromatography is commonly reported in this *Journal* (1). However, obtaining excellent separation depends on forming uniform columns, a daunting challenge for many students. This *Journal* has reported the use of a mercury-filled pressurization system for column chromatography (2), a battery-operated, portable, aeration pump for packing ion-exchange resin into a large column (3), a balloon filled with air (4), an aquarium pump (5), and a 50-mL syringe (6). A more recent article describes the use of a plastic syringe barrel as a pressurized filtration system (7). Pressurization of a Pasteur pipet is easily accomplished with a plastic syringe and a length of Tygon tubing. Even nonmajor chemistry students can pressure-pack uniform columns on their first try (Figure 1).

The apparatus costs about two dollars per student. By using pressure, the column can be dry-packed rather than slurry-packed. This simplifies the process of adding cotton

wadding, dry-packing material, and sand into the Pasteur pipet followed by the eluent. Transient pressures of 20 to 50 psi at the air-liquid interface were estimated by applying Boyle's law to the observed air compression ratios of 1.5 to 3. Because the system was open (the pipet tip is plugged with a piece of cotton, not stoppered), these pressures were easily relieved and no breakage occurred. After assembling the column, solvent was easily added to the headspace above the sand and quickly forced through the column using the syringe to pressurize the column until the packing material became uniformly wetted. The ability to easily pressurize the column also dramatically speeds the passage of a sample through the column, decreasing the time necessary for obtaining the fractions.

Chemistry students at Spring Arbor University have used this technique successfully on a wide variety of separations, such as the separation of carotene from chlorophyll in spinach extract and the separation of ferrocene from acetylferrocene. The fine control of column pressurization afforded by this apparatus allows students from first year through senior levels to obtain uniformly dry-packed columns useful for excellent separation of a wide range of chemical products.

Hazards

The materials used in the manual pressurization apparatus are inherently safe. The pressures obtained inside the Pasteur pipets are never sufficient to burst the glass. Students have reported no problems with the apparatus. Appropriate safety goggles should be worn when working with chemicals.

Supplemental Material

A student handout and notes for the instructor are available in this issue of *JCE Online*.

Literature Cited

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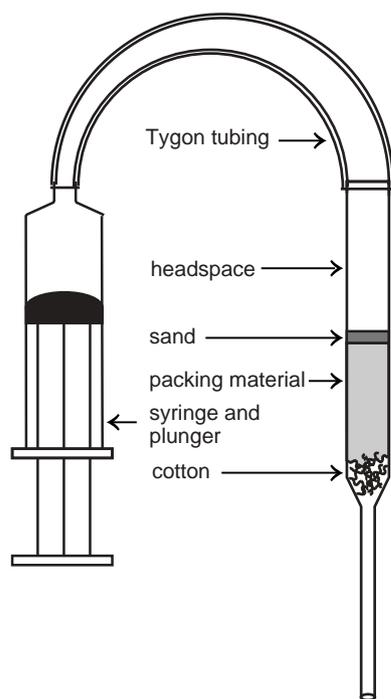


Figure 1. The manual microscale column chromatography pressurization apparatus.