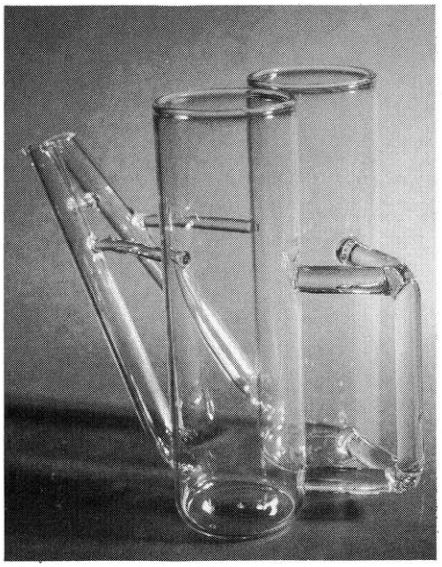
The Clock Pitcher: A New Apparatus for Dynamic Demonstrations



The iodine clock reaction has been used for decades as a fascinating chemical demonstration illustrating the dependence of reaction rate on concentration and temperature (*1, 2*). We have been to schools around New England presenting chemical "magic" shows to grade school children and have constructed a simple double-chambered "pitcher" that automatically mixes equal volumes of the two clock solutions as they are poured, making demonstrations particularly easy and dramatic.

Two pieces of 2.5-in. diameter standard-wall glass tubing about 8 in. long are each sealed at one end. Heavy-wall glass spouts are added equidistant from, and near to, the bottom. These angle out about 30° from the sides of the sealed tubes. The two spouted chambers are then joined together with 0.5-in. diameter glass rods, which form a handle, and the spouts are bent towards each other until they almost touch. A small lip is added to each. Supporting glass struts are then added (see picture).

The resulting pitcher holds over 300 mL of solution in each chamber when the spouts are only 2/3 filled. When filling with the clock solutions, care should be taken that both chambers are filled to exactly the same level. Equal volumes will then emerge upon pouring. Up to a dozen 50-mL samples can be poured out, and the blue color will appear at a constant time in each receptacle, timed from the moment of pouring into each. It is not necessary to accurately pour out a specific volume, since equal volumes of each solution are always mixed.

Filling a dozen containers with the pitcher takes only about 20 s. If the solutions are prepared so that the time it takes for color to appear is about a minute after mixing, the effect is a sequence in which all of the flasks sequentially change, one after the other, in the same order as they were poured. They can be filled in a line, or in an alternating sequence for a different effect. The advantage of quickly pouring out solutions over mixing each one from carefully measured volumes of the two different clock solutions will be clear when the pitcher is used.

The pitcher is useful for other reactions as well. For example, a bright yellow precipitate of lead iodide results from pouring colorless solutions of lead nitrate and potassium iodide out of the pitcher. A dark reddish pink solution results from pouring out colorless solutions of phenolphthalein at low pH and dilute sodium hydroxide. Numerous other interesting applications will be obvious to those who do chemical demonstrations. The "magical" effect of such changes is dramatically enhanced.

Literature Cited

1. Alyea, H. N. *Tested Demonstrations in Chemistry,* 6th ed.; Chemical Education Publishing: Easton, PA, 1965; p 19.
2. Shakhashiri, B. Z., *Chemical Demonstrations,* Vol. 4; University of Wisconsin: Madison, WI, 1992; p 16.

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