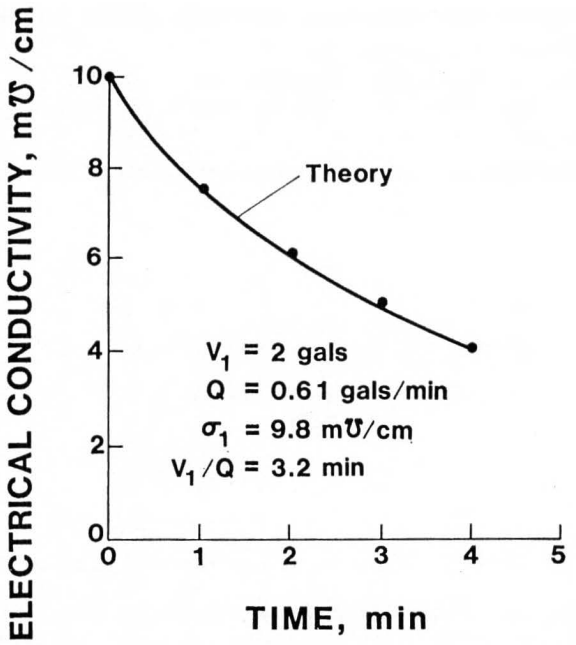

FIGURE 2. Results for closed outlet experiment

mental result. Also, the student is asked to comment on any sources of error in the experiment.

RESULTS AND CONCLUSIONS

As seen by Figs. 2 and 3, the comparison between experimental and theoretical results is very good. The data obtained is very reproducible and consistent with theory. This reinforces the validity and the limitations of the theory for the student and removes it from a strictly textbook context.

The experimental apparatus is simple in design and inexpensive. Yet, it provides the opportunity to perform two different experiments and thereby, further reduce storage space and cost per experiment.

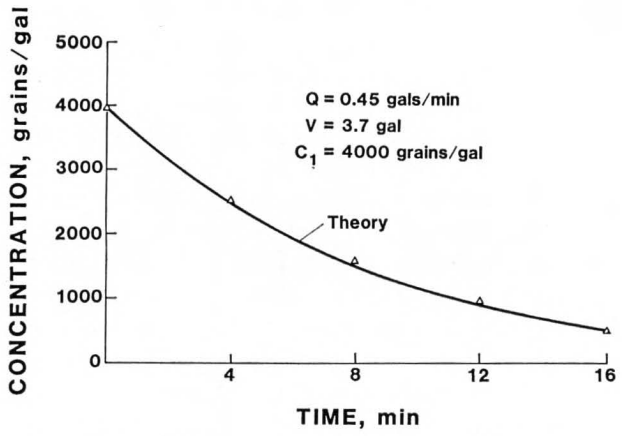

FIGURE 3. Results for constant volume experiment

The experimental procedure is also simple and allows the student to focus attention on the physical phenomenon taking place and not get immersed in the procedural detail. Students can perform multiple experiments since the procedure is simple and short in time. This also reinforces the validity of their results. Multiple tests could also be used to instruct students in data analysis (mean and variance, for example).

It is also quite simple to set up multiple experimental apparatuses so that many different groups of students could perform the experiments simultaneously. After performance, the apparatuses could also be removed and stored so that the space was available for other use.

In conclusion, the following points can be made.

- An experimental apparatus has been described which demonstrates the transient response of a stirred vessel. The apparatus is flexible in application and can be used for two different experiments.
- The experimental results are very good and consistent with theory.
- The apparatus is inexpensive and simple to operate. □

ChE letters

SUPPLEMENTS FOR THERMO FILMS

Sir:

For some years I have used the films by Noel de Nevers entitled *Phase Behavior, Parts I and II* in my courses in thermodynamics. Using high-pressure visualization equipment and time-lapse photography, Prof. de Nevers shows examples of phase transitions in both pure and multicomponent systems. The films demonstrate skillfully those aspects of fluid-phase behavior that are frequently discussed by chemical engineers.

Because so much information is presented, however, I have found that students often miss some of the subtleties. In most sequences viewers must watch a moving phase boundary along with temperature and pressure gauges, and then correlate their observations with Prof. De Nevers' commentary. For the beginning student, this can be quite difficult.

To help solve this problem, I have prepared brief summaries of the sequences. These may be discussed with students both prior to and after showing the films and also used as a basis for more lengthy study of phase behavior. I believe that the films, together with such discussions, have great pedagogical value in thermodynamics, and I would be pleased to make these write-ups available to others on request. The two films currently have a rental cost of $14.50 each and may be obtained from the University of Utah, Instructional Media Services, 207 Milton Bennion Hall, Salt Lake City, UT 84112.

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