

To the Editor:

To give an adequate reply to the letter from Professor Abrash would be difficult in the space available here. Part of the difficulty is that my two papers on "The Electron Repulsion Theory of the Chemical Bond" are a condensation of some of the material in Chapters 3, 4, and 5 in my book of the same title to be published soon. The position criticized by Professor Abrash is developed more adequately in Chapters 1, 3, and 7 of the book, to which those wishing to pursue the matter further may refer.

However, I would like to emphasize that I regard the "hybridization of atomic orbitals" and "resonance hybrids" as two false steps along our path. I believe that the ideas of Linnett and Gillespie can help us find the best path again. Furthermore, as supposedly open-minded scientists, I believe that we should consider the possibility that someone might even find some day a better approach than the Schroedinger equation.

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To the Editor:

A recent note in THIS JOURNAL by Broadbent (1) draws attention to the fact that highly dispersed copper on a support [BTS Catalyst (2)] is a very good way of removing oxygen from inert gases. While this is indeed so, this method is really quite old, and an apparatus similar to Broadbent's, together with a recipe for an excellent catalyst, was given by Meyer and Ronge (3) in 1939. I used this catalyst myself for several years at Cambridge some time ago (4) to produce dry, deoxygenated, argon, nitrogen, and hydrogen for adsorption studies (5). One advantage of the Meyer and Ronge catalyst is that when it is partially oxidized and reduced, a yellow interface exists between the two brownish regions. This visible indication of the state of the copper is very valuable as it provides an easy indication of the capacity of the system, at any given time, for further oxygen pick-up. Some color change has also been observed in using the BTS catalyst at room temperature.

Most importantly, I should like to stress that the use of copper wire at high temperature (6) or the use of copper turnings (7) at 600°C for the purification of any quantity of gases such as argon and nitrogen cannot be regarded as satisfactory. Because of the very small surface area of these forms of copper, they will react relatively slowly with oxygen and, even worse, will have a relatively small capacity for oxygen per gram of copper. In addition, neither of these methods provide any indication of the time when all the copper is oxidized, as the Meyer and Ronge catalyst does. This means that to obtain gases which are certainly oxygen free with these methods, an oxygen analyzer would have to be used. In many laboratories, such analyzers are not available. A further point is that the tubing used to convey the deoxygenated gases after purification must not be permeable to oxygen, otherwise oxygen from the air will rapidly re-contaminate the gas. Many plastics and rubber are unsatisfactory for this service, even in-

cluding such materials as Teflon. The best materials to use are glass or metal.

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- (3) MEYER, F. R., AND RONGE, G., *Angew. Chem.*, **52**, 637 (1939).
- (4) YATES, D. J. C., Ph.D. Thesis, Cambridge University, 1954.
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- (6) CLARK, W. M., "Oxidation-Reduction Potentials of Organic Systems," Williams and Wilkins, Baltimore, 1960.
- (7) MELVILLE, H. W., AND GOWENLOCK, B. G., "Experimental Methods in Gas Reactions," McMillan and Co., Ltd., London, 1964, p. 108.

To the Editor:

A recent article by Wentworth [J. CHEM. EDUC., **43**, 262 (1966)] describes an elegant experiment which illustrates the dependence of Beer's Law on monochromatic radiation.

I have adapted this experiment for use in a senior level course in instrumental analysis, and have found that measurements made using the 274 m μ absorption band of *p*-xylene in isooctane solvent are somewhat better suited for illustrating the effect of band width on Beer's Law. Using a Beckman DU with line-operated power supply and photomultiplier attachment, our instrument can be operated over the entire range of mechanical slit adjustments (0.01–2.0 mm) at 274 m μ . This provides an effective band width range of 0.027–5.40 m μ . In contrast, using the 482 m μ band of Pr(NO₃)₃, the operating slit range available with our instrument is only 0.01–0.09 mm. The effect of stray light on the absorbance of the *p*-xylene solution is apparent at slit widths below 0.02 mm.

Of course, some of the elegance is lost when measurements of broad and sharp absorption bands are made on different compounds, but I feel that the increase in operating range and the resulting versatility of operation which the student must acquire, make up for this deficit. It has been suggested (WENTWORTH, private communication) that by inserting a fine wire mesh screen between the light source and the monochromator, the radiation intensity could be diminished to the point where the 482 m μ band of Pr(NO₃)₃ could be studied over the full range of slit adjustments.

An additional experiment which helps to emphasize the effect of slit width is to record the spectrum of benzene vapor with a Beckman DB, using the "narrow" and "medium" slit program adjustments, and then using a constant slit width of ~ 0.04 mm.

These additional spectra can be obtained in a few minutes and provide an excellent illustration of the principles demonstrated by means of measurements at a single wavelength.

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