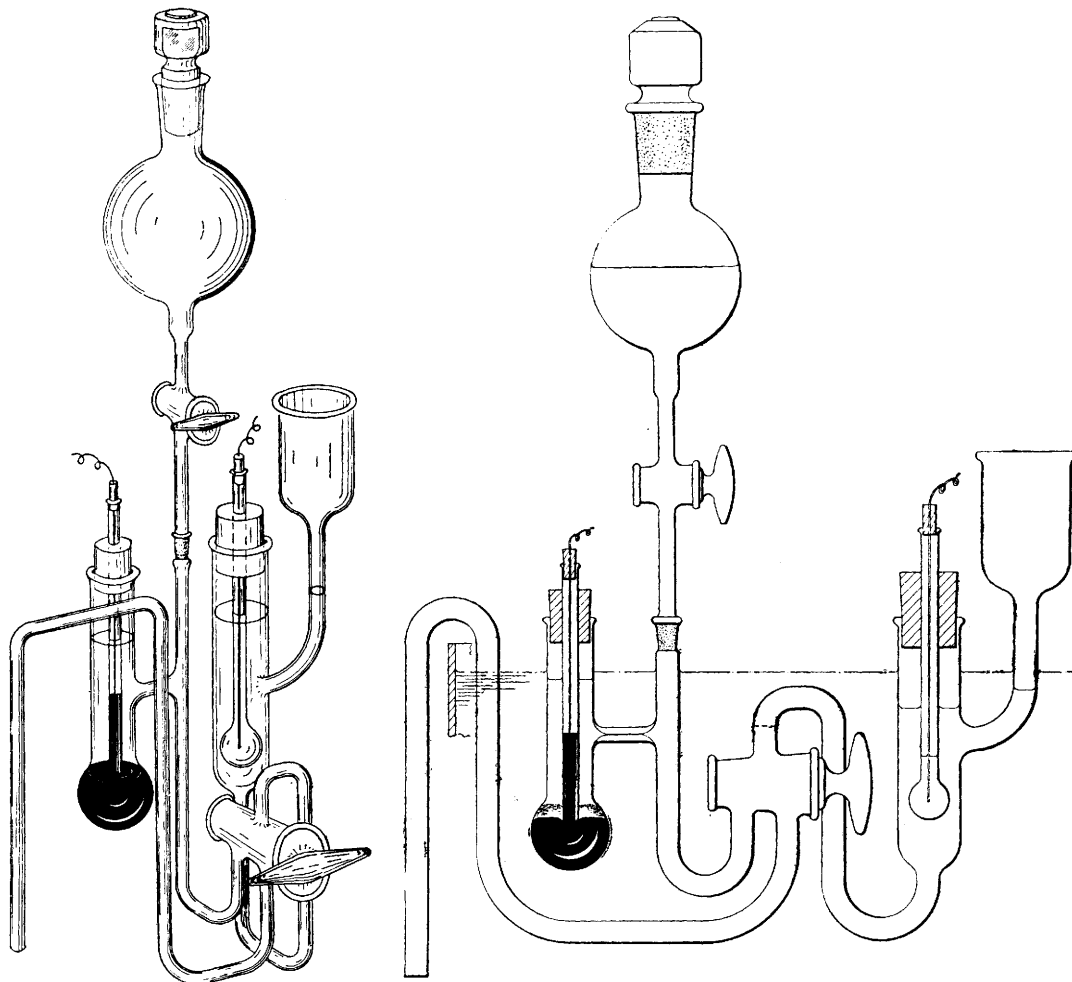


NOTES.

An Improved Glass Electrode Cell Assembly. By G. E. COATES.

THE apparatus shown in the figure has been designed for the measurement of pH to ± 0.01 unit with the minimum trouble. Numerous glass electrode cells have been devised but most of them have disadvantages in that unsatisfactory liquid junctions are formed and they are frequently difficult to use in a thermostat. Dole ("The Glass Electrode," Wiley, 1941, pp. 111—113), in a detailed discussion of liquid junctions, recommends "that wherever and whenever possible, the liquid junction be formed in a definite, cylindrically symmetrical way," and points out that fluctuations in liquid-junction potentials of this type would be less than 0.01 pH unit. Junctions formed in ground joints are particularly criticised. For accurate pH measurement, temperature control is essential, but it is very inconvenient, particularly when many determinations are to be made, to remove the cell from the thermostat repeatedly for cleaning and refilling. The apparatus to be described involves a cylindrically symmetrical liquid junction and can be cleaned and refilled rapidly and without being taken out of the thermostat; it has proved extremely convenient and reliable over a long period of use.



As shown in the figure, the glass electrode half-cell is provided with a filling side tube and may be connected by a three-way tap, either to the calomel electrode, or to the outlet siphon which leads over the side of the thermostat. The calomel electrode and the electrolyte reservoir are filled with 3.5M-potassium chloride. The bore of the three-way tap is about equal to that of the tubes to which it is joined. The operating method is as follows: 0.05M-potassium hydrogen phthalate solution (pH 4.00) is poured into the glass electrode half-cell until the liquid level in the side tube is higher than the top of the siphon; the cell is then connected with the latter and flushed out with this buffer solution, and finally the cell is filled to about the level shown in the figure and allowed to reach thermostat temperature. The calomel part, filled with 3.5M-potassium chloride (the tap below the reservoir closed), is put into communication with the glass electrode part by means of the three-way tap. The reservoir tap is then opened, and a *sharply defined* liquid junction is seen to rise slowly in the short vertical limb above the three-way tap. The reservoir tap is closed when the liquid junction is about 1 cm. above the three-way tap (broken line in figure) and the potential of the cell is measured (or the pH meter standardised). The three-way tap is then turned through 180°, and the glass electrode part flushed with water and refilled with the solution the pH of which is to be measured; the remaining operations follow the procedure described above.

The inset shows the compact arrangement of the cell as actually constructed. It is recommended that a.c. apparatus connected with the thermostat (*e.g.*, stirrer and thermoregulator) should be disconnected during the few seconds required

for the potential measurements; with this precaution water may be used as thermostat liquid. The three-way tap should be of good quality and lubricated with a good grease such as Apiezon L or N (the latter for use at 25°).

Acknowledgments are made to the Directors of the Magnesium Metal Corporation Limited for permission to publish this note.—MAGNESIUM METAL CORPORATION, SWANSEA. [Received, May 2nd, 1945.]

Some Derivatives of Eugenol and cis- and trans-isoEugenol. By T. F. WEST.

THE probable structure of the pyrethrolone side chain and the insecticidal properties reported for allyl phenols (Harvil and Arthur, *Contr. Boyce Thompson Inst.* 1943, **13**, 79) led to an examination of the toxicity to house flies of solutions of corresponding derivatives of eugenol and isoeugenol (West, *Nature*, 1944, **154**, 488). Ethers of *cis*-isoeugenol possessed a toxicity comparable with that of the corresponding eugenol derivatives whereas the *trans*-forms were noticeably less toxic. The *cis*-derivatives are more soluble in organic solvents than the *trans*-compounds and it seems possible that their greater toxicity may be due to their greater lipid solubility permitting more effective penetration across the insect epicuticle (Läuger, Müller, and Martin, *Helv. Chim. Acta*, 1944, **27**, 892). On the other hand, certain of the *trans*-forms of the isoeugenol ethers display a more lasting repellent action, and a comparison of the repellent properties of these compounds against *Aedes aegypti* will be reported by Sir R. Christophers, F.R.S., in another place.

The constants of the new compounds prepared are given below. The *O*-alkyl derivatives were prepared by the usual method from the appropriate alkyl halide and the potassium salt of the phenol in aqueous alcohol or water (West, *J. Soc. Chem. Ind.*, 1940, **59**, 275). The phenolic ether was extracted with light petroleum and purified by distillation or crystallisation. The *trans*-isoeugenol used was regenerated from the *trans*-acetate (m. p. 79°) and had m. p. 32–34°, b. p. 99–100°/0.5 mm., n_D^{20} 1.5782; benzoate, m. p. 104–105° (Found: OMe, 11.1. Calc. for $C_{17}H_{16}O_3$: OMe, 11.6%). The *cis*-isoeugenol was regenerated from technical non-crystalline *cis*-acetate (Junge, *Chem. Abstr.*, 1933, **27**, 4530) and had b. p. 80–81°/0.5 mm., n_D^{20} 1.5686; benzoate, m. p. 65–66° (cf. Boedecker and Volk, *Ber.*, 1931, **64**, 61; Junge, *loc. cit.*) (Found: OMe, 11.2%). The m. p. was depressed to 47° (indef.) on admixture with eugenol benzoate, m. p. 68–70°.

O-Alkyl deriv.	M. p.	B. p./1–2 mm.	n_D^{20} .	Found, %.	
				C.	H.
<i>Allyleugenol</i>	—	142–143°	1.5345	76.1	8.6
<i>Allyl-cis-isoeugenol</i>	—	124–126	1.5553	77.0	8.6
<i>Allyl-trans-isoeugenol</i>	—	130–132	1.5670	75.6	8.0
<i>n-Propyl-cis-isoeugenol</i>	—	117–118	1.5440	75.5	8.6
<i>n-Propyl-trans-isoeugenol</i>	50–51°	122–124	—	76.1	8.8
<i>isoPropyl-cis-isoeugenol</i>	—	112–113	1.5424	74.8	8.8
<i>isoPropyl-trans-isoeugenol</i>	—	117–118	1.5485	74.9	8.9
<i>n-Butyl-cis-isoeugenol</i>	—	125–126	1.5373	76.0	9.0
<i>n-Butyl-trans-isoeugenol</i>	26–28	130–131	—	76.1	8.9
<i>n-Amyl-cis-isoeugenol</i>	—	135–140	1.5336	77.1	9.7
<i>n-Amyl-trans-isoeugenol</i>	—	152–155	1.5404	76.5	9.0
<i>Glycoleugenol</i>	33–34	146–147	1.5435	69.1	7.7
<i>Glycol-cis-isoeugenol</i>	—	161–163	1.5654	69.3	7.8
<i>Glycol-trans-isoeugenol</i>	91–92	—	—	69.6	7.5

¹ $C_{13}H_{16}O_2$ requires C, 76.5; H, 7.8%. ² $C_{13}H_{18}O_2$ requires C, 75.7; H, 8.7%. ³ $C_{14}H_{20}O_2$ requires C, 76.4; H, 9.1%. ⁴ $C_{15}H_{22}O_2$ requires C, 76.9; H, 9.4%. ⁵ $C_{12}H_{16}O_3$ requires C, 69.2; H, 7.7%.

Benzyl-cis-isoeugenol had m. p. 32–34° (Found: OMe, 12.2. $C_{17}H_{18}O_2$ requires OMe, 12.2%). *Benzyl-trans-isoeugenol* had m. p. 59–60° after repeated recrystallisation from ethyl alcohol (Found: OMe, 11.9%). *Benzyleugenol* had m. p. 30–31° after recrystallisation from methyl alcohol (Found: OMe, 12.0%); mixed with *cis*-benzylisoeugenol, the m. p. was 27–30° (indef.). By the action of thionyl chloride, eugenol glycol ether gave the ω -chloro-compound, b. p. 137–142°/2 mm., n_D^{20} 1.5410 (Found: Cl, 15.8. $C_{12}H_{14}O_2Cl$ requires Cl, 15.7%). It was not possible to prepare corresponding derivatives from *cis*- and *trans*-isoeugenol with thionyl chloride under various conditions (cf. Hudson and Robinson, J., 1941, 715), but the *trans*-isomer gave a low yield of a crystalline product, m. p. 99–100° after recrystallisation from light petroleum (Found: Cl, 24.5%), which was not identified.

I am indebted to the Directors of Messrs. Stafford Allen and Sons Ltd. for facilities.—STAFFORD ALLEN & SONS LTD., LONDON, N.1. [Received, April 26th, 1945.]