strong and allows an easy discrimination between TiO_4 tetrahedra and TiO_6 octahedra. The method may be applied even to glassy structures, where I was able to detect spectroscopically both tetrahedral and octahedral co-ordination of titanium⁹.

P. TARTE

Department of General Chemistry,
University of Liège.

¹ Andersson, S., and Wadsley, A. D., *Nature*, **187**, 499 (1960).

² Tarte, P., *Nature*, **186**, 234 (1960).

³ Tarte, P., *Silicates Industriels*, 171 (1960).

⁴ Tarte, P., *Bull. Acad. Royale Sci. Belg.*, 169 (1960).

⁵ Tarte, P., *Fifth Symposium on Molecular Spectroscopy*, Amsterdam (1961).

⁶ Last, J. T., *Phys. Rev.*, **105**, 1740 (1957).

⁷ Kwestroo, W., and Paping, H. A. M., *J. Amer. Ceram. Soc.*, **42**, 292 (1959).

⁸ Rooksby, H. P., *Nature*, **159**, 609 (1947).

⁹ Tarte, P., *Revue Universelle des Mines* (in the press).

Selectivity of Palladium Catalysts for the Oxidation of Carbon Monoxide in the Presence of Hydrogen

It is known that a palladium catalyst used for the removal of traces of oxygen from hydrogen at room temperature is readily poisoned by carbon monoxide^{1,2}.

To remove oxygen or carbon monoxide from hydrogen containing both gases it is necessary, therefore, to work at higher temperatures. Catalysts recommended for effecting a selective oxidation of a few per cent of carbon monoxide in the presence of an excess of hydrogen are the metals of the eighth group of the Periodic System, especially platinum, rhodium and ruthenium³.

These catalysts work selectively only between about 120° and 160° C.: below 120° C. poisoning occurs, above 160° C. the selectivity becomes lost.

W. J. Hanssen⁴, when determining traces of carbon monoxide in the 5–200 p.p.m. range, applied platinum gauze at somewhat higher temperatures.

We carried out experiments with hydrogen gas containing only traces of carbon monoxide (50 p.p.m.) and found that in this case selective oxidation occurs already at room temperature. The results are given in Table 1.

Table 1. SELECTIVE OXIDATION OF CARBON MONOXIDE IN THE PRESENCE OF HYDROGEN ON 0.5 PER CENT PALLADIUM ON ALUMINA CATALYST (TOTAL PRESSURE 1 ATM., 50 P.P.M. CARBON MONOXIDE AND 0.2 PER CENT OXYGEN)

Temperature (° C.)	Space velocity (h ⁻¹)	Conversion of carbon monoxide (per cent)
20	3,000	95
20	1,000	92
30	1,000	92
50	1,000	95
75	1,000	95

Throughout the period of investigation (several days) no indication of loss of activity was noted. The carbon monoxide was shown to have been oxidized to carbon dioxide and the oxygen content had been brought down to less than 0.1 p.p.m. An increase of the carbon monoxide concentration to 200 p.p.m. resulted in total poisoning of the catalyst. The poisoning was reversible.

The reactor used worked practically isothermally. The analysis was carried out with Hanssen's method (mentioned above) adapted to our lower concentration-range.

It can be concluded that removal of traces of carbon monoxide from hydrogen (necessary in some catalytic

hydrogenation reactions) can be carried out already at room temperature.

P. MARS

TH. VAN DE MOND

Central Laboratory,
Staatsmijnen,
Geleen, Netherlands.

¹ Cohn, C., *Anal. Chem.*, **19**, 832 (1947).

² Sergeant, G. A., and Bartlett, A. F. F., *J. App. Chem.*, 208 (1955).

³ Brown, M. L., Green, A. W., Cohn, G., and Andersen, H. C., *Indust. Eng. Chem.*, **52**, 841 (1960).

⁴ Hanssen, W. J. (private communication).

pH of Soap Solutions

THE specific conductivity and pH of sodium laurate solutions have been measured at several temperatures within a concentration-range of 10^{-1} M– 3×10^{-5} M. The apparatus used was a modification of that used by Franks¹ for the chromatography of long-chain fatty acids. It enabled a concentrated (10^{-1} M) soap solution to be diluted continuously with rigorous exclusion of carbon dioxide at all stages, beginning with preparation of the soap.

Fig. 1. pH of sodium laurate solutions. O, This work; I, ref. 2 (20°); II, ref. 3 (25°)

The results are best presented graphically, and Fig. 1 shows the pH of sodium laurate solutions as a function of $\sqrt{c}$ at 20°, 50° and 75° C. The results of Ekwall² and McBain³ are included for comparison. The present pH values are consistently higher than those of earlier workers and show very little scatter. The critical micelle concentration at each temperature is indicated by an arrow. Although the critical micelle concentration at 20° seems rather high compared with other published results, this could well be due to the total exclusion of carbon dioxide. Our value of 3.4×10^{-2} M is in excellent agreement with that obtained recently from e.m.f. measurements with membrane electrodes⁴.

Fig. 2 shows the pH of a sodium laurate solution at 50° as a function of $\log c$ at extreme dilutions. At soap concentrations less than 10^{-4} M a linear relationship between pH and $\log c$ is obtained. The slope is in good agreement with the Debye-Hückel limiting law for uni-univalent electrolytes, and the soap behaves as a salt of a strong base and a weak acid. However, at concentrations greater than 10^{-4} M, marked deviations from ideal behaviour occur, possibly due to pre-association equilibria. The