for variation of viscosity with time, although such is to be expected because of the changing state of the glass. While the first term on the right-hand side has a form similar to Maxwell's relaxation, the constant a differs from his expression rigidity/viscosity by virtue of the 'hunting' action of the pressure-sensitive equilibrium upon the stress.

Morey's[8] experimental results for 'Pyrex' chemical resistance glass at 430° C., which extended over two years, are shown in the graph, where both stress (birefringence) and time are plotted as logarithms. The full curve is calculated from the expression above, while the stress calculated from the empirical law according to Adams and Williamson is dotted.

Inspection will show that the departure of the continuous line from the observed values is such as would be expected from neglect of viscosity variation.

Adams and Williamson's law holds only over a small part of the total time range, and is therefore of little theoretical significance. Its value lies in that it holds over just that range of time which is of practical importance.

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Adams, L. H., *J. Franklin Inst.*, **216**, 39 (1933).
[2] Littleton, J. T., *J. Amer. Ceram. Soc.*, **17**, 43 (1934).
[3] Lillie, H. R., *J. Amer. Ceram. Soc.*, **16**, 619 (1933).
[4] Douglas, R. W., *Nature*, **159**, 415 (1946).
[5] Cox, S. M., and Kirby, P. L., *Nature*, **159**, 162 (1947).
[6] Morey, G. W., *Ind. Eng. Chem.*, **27**, 966 (1935).

Determination of Silicate Inclusions in Steel

THE appearance of non-metallic inclusions and their influence on the mechanical and corrosion properties of steel have been the subject of many investigations[1,2]. For the determination of silicate inclusions, many methods (chlorine, bromine, iodine and electrolytic) have been used successfully. But they are all rather difficult; other simpler methods, such as the dissolution of the steel sample in nitric, hydrochloric or sulphuric acids, give uncertain results. In the search for a simple method, we used the dissolution of steel in acetic acid.

The treatment worked out by us is in outline as follows: 20 gm. very fine drillings of unhardened steel (hardened steel gives results which are too high on account of the adsorption of silicic acid on carbon) are put into 500 c.c. of 2 N acetic acid in an Erlenmayer flask. The flask has a stopper with two tubes, through one of which nitrogen is introduced (or other indifferent gas) free of oxygen; the nitrogen passes through the acid and escapes by the second outlet. The flask is put on a boiling water bath and, when the drillings are dissolved (for very fine drillings it takes three to four hours), the solution is decanted through a fine filter (Schleicher and Schüll, Blau Band) in a Buchner funnel, washed with distilled water, then with 3 per cent solution of sodium carbonate and finally with hot distilled water. The filter with the residue is ignited in a platinum crucible. Then we determine silicon dioxide in the ash in one of the usual ways; or (1) after melting it with sodium carbonate, or (2) by expelling the SiO_2 by heating the residue with a mixture of hydrofluoric and sulphuric acids after previous treatment of the residue with a mixture of hydrochloric and nitric acids (in order to remove the greater part of iron oxides). In the remaining oxides we can determine the Al_2O_3 content of the steel.

To test the method we determined the SiO_2 content of seven steels, the compositions of which are shown in Table 1.

TABLE 1. COMPOSITION OF STEELS (PER CENT)

Number of steel	C	Si	Mn	P	S
1	0·14	0·14	0·46	0·014	0·028
2	0·40	0·35	0·60	0·021	0·010
3	0·46	0·30	0·62	0·021	0·026
4	0·57	0·24	0·57	0·033	0·042
5	0·65	0·30	0·70	0·037	0·026
6	0·98	0·16	0·32	0·024	0·010
7	1·09	0·29	0·19	—	0·008

In Table 2 are summarized the results of determinations of SiO_2 by the chlorine, bromine, electrolytic (Benedicks – Skapski) and the method described above. The results of the chlorine, bromine and electrolytic methods are average results.

TABLE 2. PERCENTAGE OF SiO_2 IN STEELS

Number of steel	Chlorine method	Bromine method	Electrolytic method	Acetic method	Mean
1	0·021	0·019	0·0185	0·020 0·018 0·020	0·0193
2	0·0115	0·015	0·0097	0·012 0·010 0·009	0·0103
3	0·0055	0·0055	0·005	0·005 0·006 0·004	0·0050
4	—	0·007	0·006	0·008 0·006 0·006	0·0067
5	—	0·0105	0·014	0·013 0·012 0·013	0·0127
6	0·005	0·008	0·0085	0·008 0·008 0·007 0·007	0·0075
7	0·0023	0·0032	0·00325	0·0030 0·0029 0·0032	0·00303

The agreement of the results obtained by the new method with those by generally accepted methods is quite satisfactory. The determination of the Al_2O_3 content in steel gives good results, too, in comparison with the results obtained by the dissolution in nitric acid or electrolytic dissolution.

A detailed description of the method will be published in the near future.

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[1] McCombs, Lais F., and Schrere, M., "Bibliography of Non-Metallic Inclusions in Iron and Steel" (Pittsburgh, 1935).
[2] Taylor-Austin, *Foundry Trade J.*, **64**, 294 (1941).

Extinction of Petrol Fires by Methyl Iodide

THE distressing and increasingly frequent incidence of fatal fires in tankers, aeroplanes and other petrol-using machines, and in factories and laboratories employing fuels and inflammable solvents, has repeatedly directed attention to the need for a quick quenching agent. In such straits, so long as they

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