| Average thickness | Average time | Average force | Bending strength $B \pm 2s/\sqrt{N}$ | $N$ = number of tests | Coefficient of variation $V = \frac{s}{B}$ |
|---|---|---|---|---|---|
| cm. | sec. | kgm. | kgm./cm.² | | per cent |
| Sheet Glass | | | | | |
| 0·405 | 2160 | 62·4 | 730 ± 70 | 28 | 25 |
| 0·406 | 180 | 79·8 | 930 ± 77 | 30 | 23 |
| 0·407 | 23 | 84·6 | 990 ± 70 | 30 | 19 |
| 0·406 | 1·8 | 96·6 | 1140 ± 100 | 30 | 25 |
| Absolute difference in bending strength due to time factor 410 kgm./cm.² | | | | | |
| Toughened Glass A. | | | | | |
| 0·524 | 4620 | 331 | 2250 ± 110 | 19 | 10·6 |
| 0·523 | 312 | 343 | 2330 ± 120 | 20 | 11·9 |
| 0·522 | 32 | 342 | 2320 ± 90 | 20 | 9·0 |
| 0·524 | 2·8 | 370 | 2510 ± 170 | 20 | 14·8 |
| Absolute difference in bending strength due to time factor 260 kgm./cm.² | | | | | |
| Toughened Glass B. | | | | | |
| 0·467 | 2260 | 239 | 2070 ± 92 | 36 | 13·4 |
| 0·462 | 201 | 246 | 2180 ± 93 | 37 | 12·9 |
| 0·464 | 26 | 257 | 2260 ± 91 | 36 | 12·1 |
| 0·464 | 2·2 | 290 | 2550 ± 107 | 44 | 13·9 |
| Absolute difference in bending strength due to time factor 480 kgm./cm.² | | | | | |

After obtaining the results with toughened glass *A*, it was apparent that the total differences obtained between the highest and lowest values could have come about by chance on about one occasion in fifty, and the experiments were therefore repeated with larger numbers.

Taken together, the figures show : (1) The absolute value of the time factor in the bending strength of toughened glass is of the same order as for sheet glass. (2) The coefficient of variation of bending strength of this commercial toughened glass was lower than that for sheet glass.

As a consequence of these two properties, it would follow that toughened glass is a more reliable material than sheet glass so far as steady bending stresses are concerned.

If the point of view put forward here is correct, the bending strength of ordinary toughened glass cannot throw much light on rival opinions as to the character of the time factor, since the toughening process merely makes it more difficult to apply a stress to critical surface flaws, and the first stages of the real breaking process are the same for each of the two types of glass. However, some evidence has been brought forward by Littleton and Preston[9] that internal rupture takes place in the case of certain very highly tempered glasses. Where such a mode of rupture can be shown to exist, evidence distinguishing between the contamination theory put forward by Orowan and the other proposals may be obtained, but my experience suggests that such experiments may be difficult to perform and not easy to interpret.

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## Suspected Copper Deficiency in Cattle in Aberdeenshire

IN a recent report[1] it was shown that a scouring disease which affected cattle and sheep on reclaimed swamps and peaty soils in New Zealand was due to a deficiency of copper in the pasture. Affected animals showed low levels of copper in blood and liver ; the pasture contained only 2–5 p.p.m. of copper on a dry-matter basis compared with 'normal' levels of 10 p.p.m. or more, and the disease could be controlled by administration of copper to the livestock or by top-dressing the pasture with fertilizers containing copper. This 'peat scours' of New Zealand resembles the scouring disease in cattle attributed to copper deficiency on the sandy soils and reclaimed polders of Holland[2,3].

We have recently observed what appears to be a similar condition in young cattle on a small Aberdeenshire farm on land newly reclaimed from heather. Analysis of the pasture indicated that the only significant feature was its very low copper content.

COMPOSITION OF PASTURE (DRY MATTER BASIS).

| Ash | $P_2O_5$ | $K_2O$ | CaO | MgO | $Na_2O$ | MnO |
|---|---|---|---|---|---|---|
| % | % | % | % | % | % | % |
| 5·8 | 0·52 | 1·42 | 0·92 | 0·30 | 0·25 | 0·032 |

| Co | Ni | Mo | Fe | Cu |
|---|---|---|---|---|
| p.p.m. | p.p.m. | p.p.m. | p.p.m. | p.p.m. |
| 0·12 | 0·57 | 0·62 | 122 | 2·5 |

One of the three affected animals which had been scouring badly showed a hæmoglobin content of 7·9 gm. per 100 ml. and a red cell count of 7·5 million per c.mm. It died before any treatment could be given. The two remaining animals, which had been taken off the 'affected' pasture, were drenched with copper and showed some improvement. Fæcal worm-egg counts excluded parasitic infestation as a causative factor.

Despite the preliminary and inconclusive nature of these observations, they were thought to be of sufficient interest to justify recording, pending further investigations of this and other cases of scouring of unknown etiology in the district. So far as we are aware, the occurrence of disease in grazing livestock associated with pastures low in copper has not previously been reported in Britain.

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## Toxicity of Thiourea to Rats

DIFFERENT workers have found the toxicity of thiourea to rats to be very variable[1,2,3]. Dieke and Richter[4] claim that the degree of susceptibility of rats to poisoning by thiourea can be correlated with breed and age. They also suggest that diet plays some part.

In our laboratory, well-fed experimental rats of the hooded (Rowett) strain tolerate thiourea well in doses up to 200 mgm. To determine whether a dietetic factor is responsible for the toxic effect reported by others, a large group of rats was fed an unsupplemented diet, and occasional rats died after small doses of thiourea. Pregnant and lactating animals on such diets are susceptible to very small doses. A diet of oatmeal induces maximum sensitivity to the toxic action of thiourea. Animals maintained on oatmeal for periods of four weeks or more become