Finally, there are certain other situations in which the Hartree units are modified in some relatively simple fashion. The best example is perhaps the use of $Z\hbar e$ as unit of charge instead of e in certain perturbation treatments of isoelectronic sequences. We suggest that such modified energies be called 'modified Hartrees' and denoted by H_M , or perhaps H_z , and that the particular modification should be carefully defined in each paper in which it is used and the conversion factor to Hartrees stated. It should be noted that since mass and charge are both taken as basic units, the reduced mass and the modified charge produce independent alterations of the energy and give a modified reduced Hartree, H_{MR} .

There are difficulties of exactly the same nature with the atomic unit of length. The most usual symbol, a.u., is cumbersome and unhelpful while the symbol a_0 , although it is more descriptive, is unnecessarily cumbersome since the subscript now has historical meaning only. This unit is usually called the first Bohr radius, and we should like to suggest that this be abbreviated to the 'Bohr' and denoted by b so that, in terms of the basic units:

$$b = \hbar^2/me^2$$

In exactly the same way as for the energy, the use of μ will lead to the reduced Bohr, b_R , and of a different charge to a modified Bohr, b_M .

Probably the next most useful unit for theoretical molecular calculations is the electric moment. We suggest that the appropriate unit should be:

$$eb = \hbar^2/me$$

but we do not wish now to suggest any special name or notation for it.

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Strength of Glass Fibres

AN attempt has been made to eliminate the effect of surface discontinuities on the tensile strength of glass fibres by producing specimens coated with a glass which at elevated temperatures behaves as a viscous liquid whilst the core remains a brittle solid. Assuming some inter-diffusion at the boundary between the two glass compositions it was expected that the silicon oxygen random network structure of the two glasses would be continuous across the boundary and that there would be a gradual transition, on the molecular scale, from the solid to the liquid phase.

These ideal concepts are difficult to realize under experimental conditions. Besides the necessary viscosity-temperature relationships it is also required that the thermal expansion coefficients should match closely or alternatively be such that the coating is in compression when the specimen is cold. Otherwise there is a tendency for specimens to fracture spontaneously during cooling. In addition there should be no tendency towards phase separation at the boundary due to mixing of the two glass compositions.

Specimens have been produced having a core of composition by weight

per cent of CaO, 23.3; Al₂O₃, 14.7; SiO₂, 62.0 and a coating of 'Pyrex' glass and tensile strength tests have been made on them at 700° C. The compositions fulfil the first two requirements outlined above, but there is an apparent tendency towards phase separation under certain conditions and this limits the value of heat treatment in promoting diffusion at the interface.

Coated fibres about 3 in. long and 0.05 in. thick have been produced by normal glass-working techniques and these were afterwards drawn down at their centres to produce a test length of fairly uniform diameter about $\frac{1}{2}$ in. long. The ends of the fibres were heated to form beads which served as attachment points for stainless steel clamps by which the fibres were loaded. The samples were supported in an electric tube furnace so that the test length of the fibre was at a uniform temperature of about 700° C. They were then loaded by allowing water to flow slowly into a container attached to one end of the fibre. The time taken to fracture averaged about 10 min.

The stress at rupture for each specimen was calculated from a knowledge of the load applied and the cross sectional area of the core of the fibre. The latter was evaluated from a microscopic examination of the fracture surface of the specimen. The boundary between the two compositions could be distinguished quite easily by suitable illumination.

The experimental results shown in Fig. 1 are for fibres varying in diameter from 0.002 to 0.010 in. Over this range the effect of fibre thickness noted by previous workers^{1,2} is small compared with the differences found to exist between coated and uncoated fibres. The variability of the results is very great; but the maximum tensile strength values of the coated fibres was found to be several times greater than that of uncoated specimens of the same thickness.

An attempt is being made to evolve compositions which will eliminate any tendency towards crystal growth at the interface due to mixing of the two compositions and which will enable specimens to be manufactured under more closely controlled conditions.

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Fig. 1. Frequency of results as a function of fibre tensile strength. Thickness range $2-10 \times 10^{-3}$ in.