under suitable experimental conditions. Some observations[11-13] have been reported in the literature which might be interpreted on this basis.

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Correlation of impact strength and rubber phase volume fraction in impact polystyrene

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A recent paper[1] considered the effect of rubber phase volume fraction (*RPVF*) on the mechanical properties of impact polystyrene. The authors found, among other things, that the notched Izod impact strength increased with increasing RPVF.

Although they do not discuss this relation quantitatively, their data are plotted in *Figure* 1; the impact strength at 0% *RPVF* has been added, and is taken as the 0.25 ft lb/in. found in most tables for general purpose polystyrene. The data are linear and fit the equation:

$$(\text{Impact strength } \pm 0.045)\ \text{ft lb/in.} =$$
$$(2.17 \pm 0.14) \times RPVF + 0.23\ \text{ft lb/in.} \qquad (1)$$

As expected, the intercept is near 0.25 ft lb/in. Statistical analyses by *T*-test and correlation coefficient indicate significances to greater than the 99.95th percentile. This volume effect is surprising, since impact strength in such cases was thought to be due to the ability of the rubber phase surface to limit the extent of experimentally seen[2] voids and crazes.

Table 2 of the paper indicates that the rubber phase damping peak areas of the samples are in the ratio 1:2:3, while their *RPVF* and impact strength ratios are both 1:1.4:2. Thus, while qualitatively correlating well with both *RPVF* and impact strength, the peak areas quantitatively correlate poorly.

It was recently pointed out[3] that impact strength and dissipation factor are linearly related when both are evaluated under the same conditions. The main reason for this, as indicated earlier[3], is the absence of plastic deformations at the high strain rates of impact.

While impact strength has an equivalent frequency in the kHz range, dynamic mechanical properties are evaluated at much lower frequencies. Using the extrapoaltion scheme discussed in ref 3, an impact at ~2 kHz/20°C is equivalent to one at 1–10 Hz/10°C. Such dissipation factor values correlated well with impact strength for a wide variety of materials[3].

In the present case, log decrement values ($=\pi \times$ dissipation factor) were taken directly from the figures of the paper at 10°C, in addition to a value of 0.01 for 0% *RPVF*[4]. They are plotted in *Figure* 2, which fits the equation:

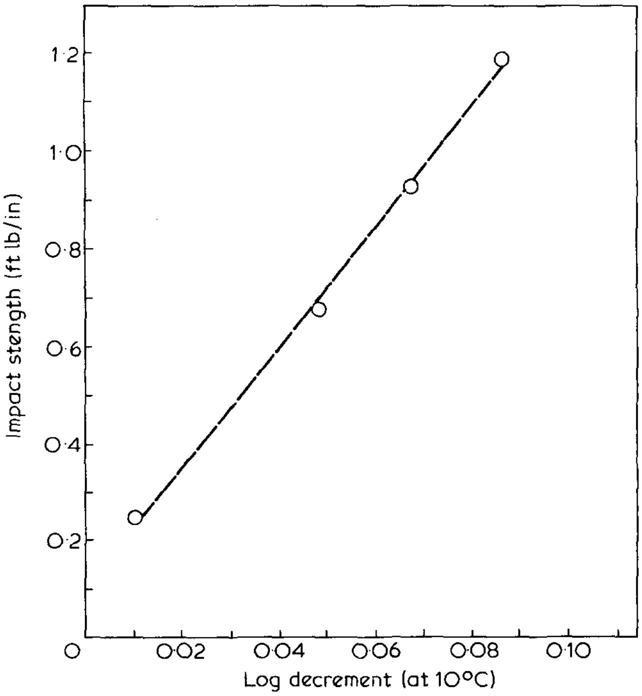

Figure 1

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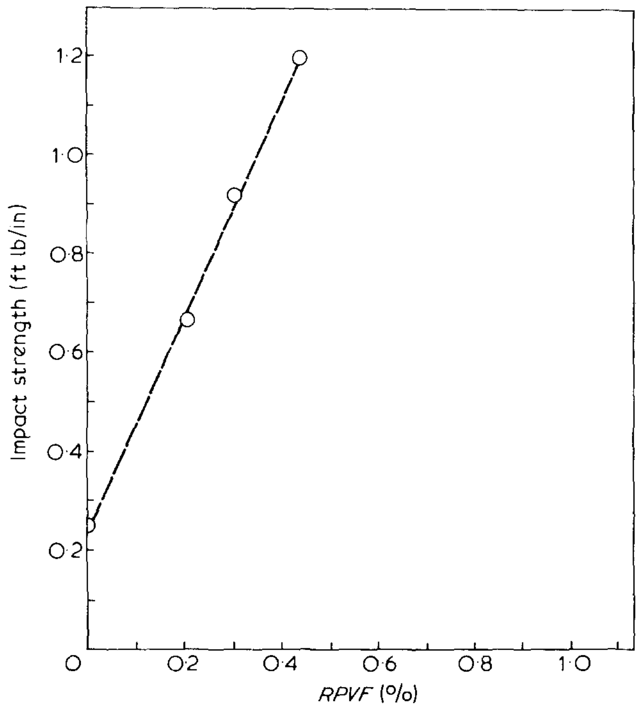

Figure 2 Impact strength vs. *RPVF*

$$(\text{Impact strength} \pm 0.062)\ \text{ft lb/in.} =$$

$$(12.28 \pm 1.10) \times \text{log decrement} + 0.094\ \text{ft lb/in.} \qquad (2)$$

Again, the plot is significant to greater than the 99.95th percentile.

Thus, it is clear that here, too, impact strength and dissipation factor correlate well when evaluated under equivalent conditions. This, together with the findings that impact strength and log decrement are linearly related to the volume of the rubber phase, indicates that the assumptions made for homogeneous polymers[3] are true for these heterogeneous polymers, as well: impact strength is imparted by an energy dissipation mechanism at the temperature and frequency of the impact. The ability for such a mechanism to dissipate impact energy is volume-related.

One should, however, not lose sight of the fact that these correlations are empirical. Further work needs to be done to better understand the reasons for their existence.

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Raman study of oxygen induced isomerization of $(CH)_x$ films

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Polyacetylene, $(CH)_x$, is the simplest organic polymer with attractive conduction properties. Doping $(CH)_x$ with appropriate dopants can change its conductivity markedly giving properties covering the whole range from semiconductor to metal[1]. Nevertheless, great care has to be taken, particularly to avoid any contact with oxygen since some properties are dramatically affected by oxidation: conductivity can be drastically reduced upon exposure to air[2]. Oxidized samples have also been reported to have quite poor mechanical properties (no possibility of partial stretching[3]) and finally can be doped to much lower efficiency than fresh samples.

Recent e.p.r. experiments[4] carried out during isomerization of an initially *cis*-film were interpreted by assuming that the e.p.r. signal was due to defects in the double bond conjugation of *trans* sequences. Following this hypothesis, two main points appear clearly: (i) oxidation of a *cis*-sample induces a partial *cis–trans* isomerization; (ii) oxidation of a *trans* sample leads to some extent to a decrease in the length of *trans* sequences in the chains.

Here we describe Raman scattering experiments showing the behaviour of $(CH)_x$ films when exposed to air, in order to check the validity of the above hypothesis. Raman spectra of $(CH)_x$ are well known[5–7] for both *cis*- and *trans*-isomers. The main purpose of these experimental measurements is to follow unambiguously the *cis–trans* content in the films, which is of great importance here. Experimental conditions have been chosen so that Raman spectra of reasonable intensity can be recorded for both isomers, i.e. an exciting wavelength in the red range, 600 nm. The Raman spectrum of the *cis*-$(CH)_x$ is composed of three strong and sharp lines at, respectively, 908 (A), 1247 (B) and 1541 (C) cm^{-1}. For the *trans*-isomer, two broad bands are observed at 1080–1120 cm^{-1} (A′) and 1450–1540 cm^{-1} (B′) of which maxima appear at 1080 and 1450 cm^{-1}, respectively, for the wavelength used[7]. Samples were immersed in liquid nitrogen and the incident power

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