Natural weathering of polyester filaments

It has recently been possible for us to examine the morphology of filaments in polyester (polyethylene terephthalate) fabrics which had been very highly degraded by natural weathering. The fabric was in the form of two burgees which had been flying at the mast-head of sailing dinghies continuously for about two or three seasons, with storage between seasons. The sailing was mainly on a fresh-water canal-feeder reservoir, with a few exposures to sea-water.

One, which was yellow, had almost completely disintegrated, while the other, which was blue, had lost a few centimetres of material at its outer edge and was weak elsewhere. The major causes of degradation would probably be the effects of sunlight and mechanical vibration, with a possible contribution from atmospheric exposure, moisture and microbiological action. Although this was not a controlled experiment, it is of interest to observe the form of damage, which results from extreme exposure, to an extent which leads to almost complete loss of

Figure 1 Torn region at edge of fabric (× 55).

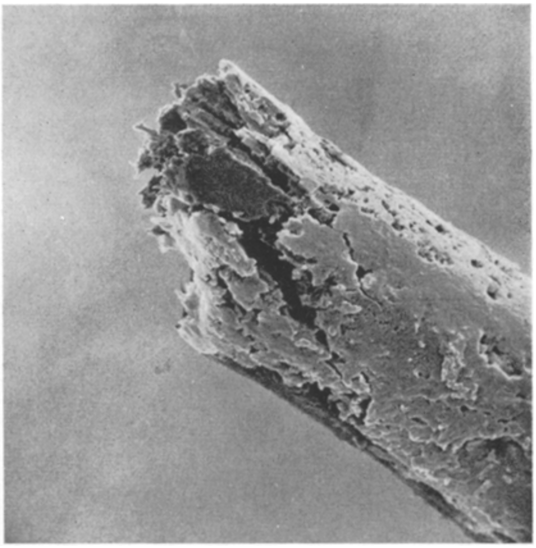

Figure 3 Broken end of filament (× 1590).

Figure 2 Surface of crowns, showing broken filament (× 710).

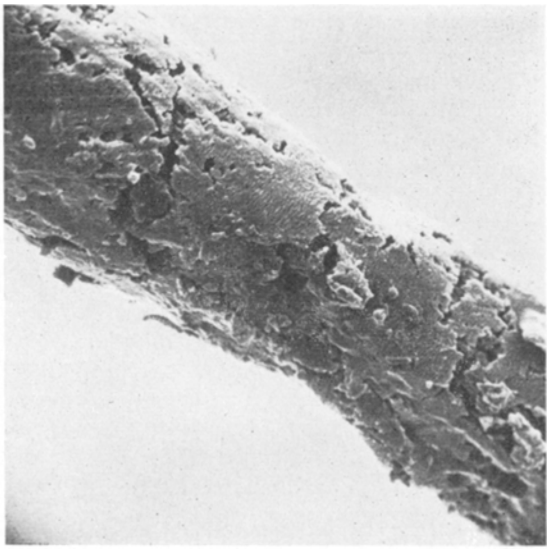

Figure 4 Region slightly away from broken end (× 1700).

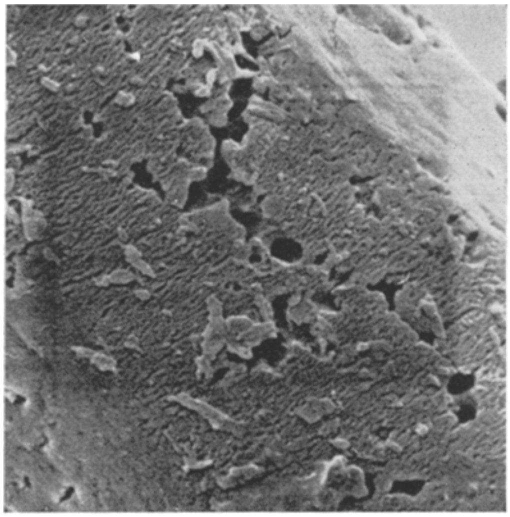

Figure 5 Crazing of filament surface (× 4700).

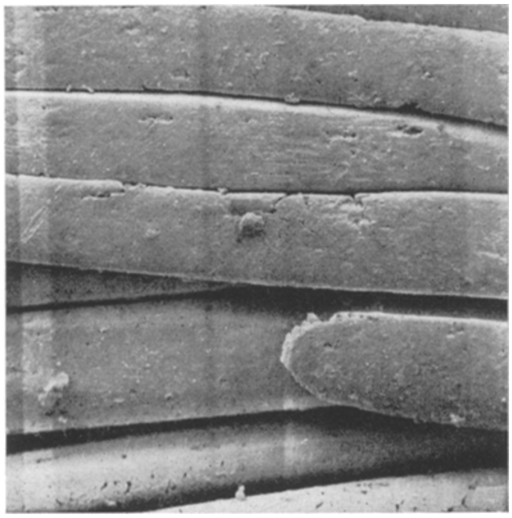

Figure 6 Crown of blue burgee showing some pitting and cracking (× 860).

strength.

Portions of the burgees were examined in the Cambridge Stereoscan scanning electron microscope. The surface of the filaments in the yellow fabric was found to be highly pitted, and some of the filaments on the yarn crowns had broken (Figs. 1 and 2). It was observed that the flag did not tear preferentially in either the warp or weft direction (Fig. 1), but breakdown had resulted from general weakening of the fabric. The broken filaments had a very ragged and pitted appearance (Fig. 3), although there was some evidence of the broken ends beginning to be rounded off, in a way similar to that observed in worn garments made from polyamide and polyester yarns. There were indications of loss of material at some distance along the filaments from the broken ends. Fig. 4 shows such a region of reduction in filament diameter, where the filament would be very susceptible to breakdown, and is taken several fibre diameters back from the broken filament end shown in Fig. 3. Examination of the filaments at higher magnifications showed that besides holes and crevices, the filament surfaces frequently showed many cracks perpendicular to the fibre axis (Fig. 5). However, where filaments were in contact with one another, these surfaces had a smoother appearance but still contained holes and crevices.

The lower level of damage in the blue burgee, which had not been used quite as much as the yellow one, is shown in Figure 6. This is similar in type, but no fine crazing of the surface of the filaments was observed. There was also evidence of a fungus growth on the yarns but not of actual damage to the filaments.

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Preparation and electrical behaviour of Mg_5Hg_3

An intensive study of the electrical characteristics of intermetallic compounds has been performed in order to understand their most important physical properties. The aim of this work is to present our results on the low temperature electrical behaviour of Mg_5Hg_3 – one of the six intermetallic compounds known to occur in the Mg–Hg system.

The congruent melting Mg_5Hg_3 compound belongs to the Mn_5Si_3 ($D8_8$) structure group [1] and has the lattice parameters a = 8.260 Å and c = 5.931 Å.

For the preparation of the samples, magnesium