Petition to establish a new generic subclass of polyester for PTT

Report of Martin Bide, Ph.D., C.Col. FSDC, C.Chem FRSC
Department of Textiles
University of Rhode Island
Kingston, RI 02881

Report/Conclusion:

The companies making the petition are long established and have the appropriate skills and technology for providing the information upon which the petition is sought. They have carried out appropriate tests, and have used reliable sources of independent information upon which to base their request.

The petition occasionally overstates its case. It is not a well crafted document, with a number of confusions and mislabeled figures. These are detailed in the comments that follow.

These notwithstanding, the petitioners make a convincing claim that the properties of articles made from PTT fiber have properties of importance to the consumer that are sufficiently distinct from those of PET that a new generic subclass is justified.

The petitioners quote FTC notice of proposed rule making of February 15 2002 at 67FR 7104 point out, the FTC has three tests for the establishment of a new generic sub class of fiber

Thus, a new generic fiber subclass may be appropriate in cases where the proposed subclass fiber:

(1) Has the same general chemical composition as an established generic fiber category;
(2) has distinctive properties of importance to the general public as a result of a new method of manufacture or substantially differentiated physical characteristics, such as fiber structure; and
(3) the distinctive feature(s) make the fiber suitable for uses for which other fibers under the established generic name would not be suited, or would be significantly less well suited.\4\

The petition refers to "conventional polyester PET" as "the other polyester". They do not refer to PCDT, a polyester that has been sold commercially as "Kodel" that is not PET. That would serve to reinforce the petitioners' case, as PCDT is chemically more distinct from PET than is PTT, and yet has properties that are very similar to PET and hence would probably *not* merit a distinct subclass.

The two major potential markets for PTT fibers are in carpet and apparel. The petitioners make appropriate comparisons between PET and PTT, and also between nylon and PTT, since nylon is the major carpet fiber in use: those comparisons also serve to point out that the properties of PTT are in many cases closer to those of nylon that to PET. For carpet use, the hexapod wear test is a well-established protocol, and the data of Figures 9-11 are convincing in providing evidence of the difference in performance of PTT over PET, and in showing that PTT is close to nylon 6,6 in its performance. A difference in performance of this size reinforces the contention that PTT has properties of importance to the public that merit its designation into a generic subclass.

The petitioners make a convincing claim about the key provision in the requirements for a new generic subclass through consumer preference survey of carpet attributes, and later linking these to the properties of carpet made from PTT fibers.

The preference of survey respondents for "stretch with recovery" is well stated, and the data which show that PTT is superior in this respect to PET are convincing.

The discussion of factors on page 6 et seq. is also convincing. The petitioners are accurate in their contention that PTT is, according to the current FTC definition, "polyester".

It is clear from the material provided that PTT fibers fulfill the requirements for a new generic subclass in that they (to paraphrase the FTC's tests)

- are of the same general chemical composition as the established generic category in which PET fibers are well-known
- have distinctive properties of importance to the general public as a result of substantially differentiated physical characteristics
- are suited for uses which other fibers under the established generic name would be significantly less suited

I recommend that PTT fiber be given a new generic designation as a sub class of the existing generic class of polyester.

Comments

These comments are made as a result of the reviewer's reading of the petition. In many cases these comments (if adopted in a revised petition) would lead to a more convincing and accurate picture of the novelty of PTT as compared to PET, and thus a more convincing case. It is also an opportunity to point out some simple errors that if corrected would give future readers of a petition that is "on the record" a better view of the care with which the petition was put together.

While political correctness is not a requirement, the occasional use of the term "man-made fiber" might be replaced by a more neutral "manufactured fiber"

The linking of durability and resilience in the summary of the petition is inaccurate: the petitioners make a perfectly good case for the better resilience of PTT as compared to PET, but "durability" is a far more nebulous (and essentially unmeasurable) property. In carpets resilience and durability are closely linked, but in other fiber applications, durability is only marginally related, if at all.

On page three, the petition states "the four principal types of man-made fiber used to manufacture carpet were....." and goes on "Of these three materials....". This number disagreement should be resolved.

In my opinion, the petitioners continually overstate their case in claiming softness and durability. Fibers are perceived as soft depending on how flexible they are, and the major determinant of flexibility is fiber diameter. It is probably true that in producing a carpet fiber, the diameter of the fiber has to be sufficient to provide resilience, and that the softness is of secondary importance. This is hinted at in the statement (page 3): "...compared to many recent nylon carpet constructions, PET fibers were less flexible and not as soft as some nylon constructions" [sic]. I take this to mean that to get a carpet of sufficient resilience from a fiber that is inherently less resilient, PET fibers of larger diameters (and thus lesser softness) are used.

I am unaware of a difference between "mean" and "average", and yet in Figure 1 they are provided separately. Figure 1 has a "small square", a "box" a "horizontal line" that are explained, but a vertical line projecting above and/or below the box that is not explained.

Again, in Figure 1, softness is referred to, with the rider "also referred to as drape". While related, softness and drape are not interchangeably used. Flexibility (hence drape) is an important component of hand, while softness is generally a separate component of overall hand, and is highly related to compressibility. In any case, the role of the fiber type in "softness" is subordinate to fiber diameter, yarn construction, and fabric construction in providing these attributes.

On page 5 the petitioners claim simply that "PTT fiber is superior to PET fiber with respect to two of the three attributes, softness, and stretch with recovery". It is not clear how softness is measured to allow this statement to be made. Later in the petition, the

petitioners argue that fibers of PTT are "softer", and correctly point out that softness is closely related to the force required to bend the fibers. However, it would be more accurate to include a phrase like "for a given fiber diameter" when explaining that PTT fibers bend more easily. The explanation for the greater ease of bending of PTT, a lower crystalline modulus derived from a different molecular conformation, is essentially correct, although again they omit to point out that the data are of pure crystalline material, while real fibers are only partly crystalline, and the difference in modulus will be less than the numbers suggest.

While the data of Table 3 do correspond to a more flexible material, once again, the matter is a little overstated: for example, nylon 6 and nylon 6,6 are both excellent carpet fibers, but have a difference in crystalline melting point that is greater than that between PET and PTT.

The opposite of softness in textile fibers is not usually described as hardness (a hard fiber?) it is usually stiffness, and thus the greater Young's modulus of PET (figure 5) is better described thus.

Figure 6 shows a stress-strain diagram of PTT and comparative fibers. The diagram covers the extension of fibers to the point at which they break. This is not relevant to the discussion of modulus and the relation to "softness" and thus the figure's title of "modulus" is misleading. Modulus is usually derived from the slope of the initial (straight) portion of the curve, before a yield point is reached. It is unclear from this diagram how the curves of the different fibers relate to each other at low loads, where "modulus" would be apparent. Figure 16 also shows the stress strain curves of the same fibers, and both figures compensate for fiber size on the y-axis, but the curves are different: two of them cross in figure 16. The petitioners would do well to explain this seeming discrepancy.

The elastic recovery derived from Figures 7 and 8 is important in giving the property of resilience for carpet applications. The measurement of elastic recovery described via Figure 7 is unnecessarily complicated: it is not necessary to perform a second stretching to derive figures for immediate and total recovery, and permanent set.

The statement that the "standard human traffic test used by the carpet industry is known as the Kruskal-Wallis test" is a misstatement that should not be allowed to go without comment, or correction. The KW test is a statistical analysis used to determine significant difference from a set of data, and can be applied in any field of enquiry: it does *not* refer to a carpet traffic test. I understand therefore that this KW test was used to analyze carpet appearance data from a wear test.

The petition refers to Figure 15 "provided as additional confirmation...". Since the petition includes two Figure 16s, I assume that the first figure 16 should be labeled "Figure 15". Since this is a carefully controlled study when, as far as possible, all differences other than fiber type are eliminated, this would be better offered as primary evidence, rather than "additional confirmation".

Reference has previously been made to the potential confusion between the data of Figures 6 and 16. That confusion made worse by the discussion centering on the softness of *yarns* instead of fibers. Two yarns may have the same dtex value, but contain different numbers and sizes of individual filaments. I assume when the petitioners describe the comparative softness of two 56dtex yarns that they do have the same number of filaments, but it should be stated directly that this is the case.

Page 21 of the petition gives Softness (average of 300 measurements) data. The figure seems to have no accompanying text, the lower part of the figure is illegible, as is the units in parentheses on the y-axis of the chart. If the columns represent averages, it is appropriate that the reader be given some measure of the range of the data and an assurance that the differences are statistically significant.

The discussion that begins on page 22 is similarly convincing but confusing. The production of two knit fabrics with identical construction is described, and the elongation after identical loading (and the resulting set) is measured. The different elongation is than explained as "an artifact of fabric construction as explained below": but "below" deals with a *woven* fabric (!). Whatever the artifact that causes the different elongation, it is arguable that the difference in set arises *because* of the greater elongation.

Under the discussion of woven fabrics, Figure 18 is referred to, but no figure 18 is provided. Figure 19 should be it, but has only one bar for PET and one for PTT, while the discussion refers to "three fabrics". If the data of Figure 19 are an average of the three, it should be made clear. And if there are three fabrics, what are they? Only two woven fabrics are refereed to (!) The label for Figure 19 uses the common European abbreviation for polyester as "PES", which may be confusing.

The petitioners include information about the recycling compatibility of PET and PTT as justification for a new sub-class generic designation. This enters an area of discussion that is of uncertain relevance. It is highly doubtful that waste stream separation would rely on a label, as opposed to some analytical test. Similar problems might well exist in cases where no other reason for a separate generic classification exist, as with nylon 6 and 6,6, for example.