

Zaelon™ Dental Tapes

Zaelon™ is a unitary filament with high modulus and tensile strength made of a special polyethylene (ultra high molecular weight polyethylene) that has been used in biomedical and industrial applications for more than three decades. It has a continuous and coherent fibrillar structure of aligned and extended long chain macromolecules, unlike the multifilament yarns in which the fibrillar structure is loose. The Zaelon™ fibers and the process of making them are patented. They have been the subject of long-term research and development conducted by scientists at Polteco Inc., an affiliate company of Quden, in California, that specializes in polymer engineering for specific applications.

Zaelon™ fibers are made with combinations of physical and mechanical properties to meet the needs of specific applications. For dental floss, for example, they are made in the form of very thin and soft tapes that are significantly thinner than any other available dental tape product. Because of their high tensile strength, the "ultra-thin" Zaelon™ tapes are strong enough to be used in tight spots between teeth without breaking. The special polyethylene that is used for manufacturing the Zaelon™ dental tapes is known for its outstanding wear resistance, an attribute that has made it the preferred material for the wear bearing components in a broad range of applications such as orthopedic implant replacements for hips and knees, and skis and snowboards for their bottom surfaces. As a result, the Zaelon™ dental tapes have an exceptional resistance to shredding. Figure 1 shows the degree of shredding of different dental floss and tape products after sliding against a sharp edge in comparative tests with the Zaelon™ dental tapes. The dental floss products of nylon yarns shred readily into loose fibrils and the yarn becomes weak and breaks. The dental tapes shred with long sections of the tape shearing off in layers, or by fibrillar fragmentation like the nylon yarns but to a lesser extent. In contrast, under the same testing conditions, the Zaelon™ dental tapes maintain their integrity. In addition, Zaelon™ tapes are designed to have considerable elasticity, so that they can be held taught more conveniently during their use, and controlled surface friction, so that they do not slip on the fingers.

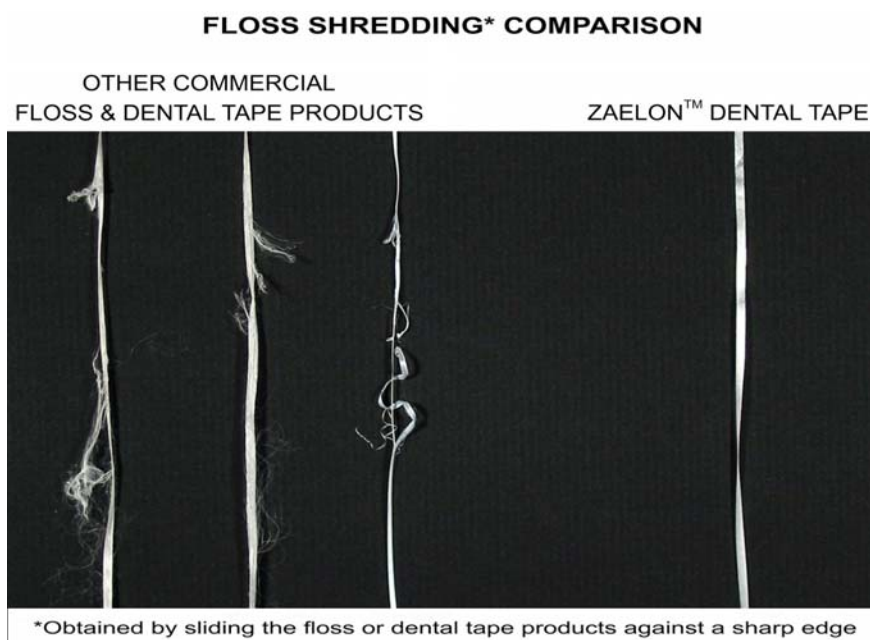


Figure 1. Comparison of shredding of ZaelonTM and other commercial floss products

How do the ZaelonTM dental tapes compare to the dental tapes of other advanced materials? The Table below shows a comparison of various properties of ZaelonTM and brand name tape products. The ZaelonTM tapes are the thinnest, yet strongest.

| Brand Name Dental Tape Product | Thickness (micron) | Denier (d) | Breaking Force (g/d) | Extension at break (%) |
|--|-----------------------|---------------|----------------------------|------------------------------|
| Zaelon TM | 60 | 740 | 4.3 | 20 |
| Glide [®] Comfort Plus | 109 | 990 | 2.4 | 20 |
| Reach [®] Easy Slide [®] Ultraglis | 66 | 1660 | 1.8 | 6 |
| Oral-B [®] SATInfloss [®] | 94 | 800 | 3.5 | 23 |
| Colgate Total [®] | 114 | 1300 | 3.8 | 20 |
| J&J Dentotape [®] | 203 | 1500 | 4.1 | 30 |

The surface characteristics of dental tapes made of ZaelonTM, as well as a fluoropolymer such as Glide[®] and a dental floss made of nylon yarn, were evaluated by scanning electron microscopy and are shown in Figure 2.

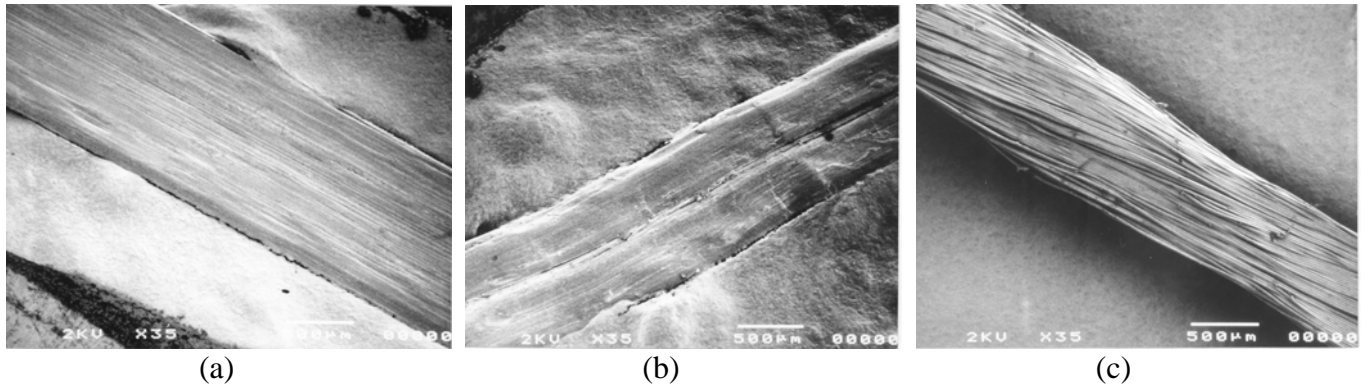


Figure 2. Scanning electron micrographs showing the surface topography of dental tapes of a) Zaelon™, b) a fluoropolymer and c) a dental floss of nylon yarn.

The scanning electron micrograph of the Zaelon™ and the fluoropolymer dental tapes show that they both have a unitary fibrous structure. The fibrillar structure of the Zaelon™ tape is uniform and visible along the tape length. In the fluoropolymer, the surface topography appears irregular and the fibrillar structure less uniform. Both tapes are distinctly different from the dental floss of nylon yarn, which has a loose filamentary structure. Such structure can shred readily with abrasion against a sharp or non-uniform surface.

Furthermore, the Zaelon™ tapes are porous, an advantageous physical condition that makes the tapes softer and amenable to additives.

In summary, in comparative tests with other materials, the Zaelon™ dental tapes:

- are the thinnest yet the strongest,
- have superior shredding resistance followed up by the less shred resistant fluoropolymers, e.g. Teflon®, and nylon tapes, and the least shred resistant nylon yarns)
- have a balanced elasticity (15-20%) before breaking for comfortable handling during flossing, and
- have controlled surface friction for easy gripping.

Zaelon™ dental tapes were designed specifically to bring out the best combination of properties for flossing and represent advancement over what other materials are offering.