

Medical textiles: how PET fibers topography affects wettability

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Introduction: Textile material has been successfully used over the last decades in various medical applications like suture yarn, vascular graft, stent graft and hernia mesh. More recently, it has been shown that textile material could be considered to replace heart valves. In that latest application in particular, the foreign body reaction (FBR), once the textile is implanted *in vivo*, becomes a critical issue. Actually, FBR consists in fibrotic tissue ingrowth, which tends to stiffen the initially porous material, impeding the valve leaflets movement. However, the phenomenon is limited if the textile surface is hydrophilic. This latter property depends on the polymer used but also on the textile topography. The goal of the present work was to investigate how the yarn structure, topography as well as the textile construction can affect the wettability of a textile surface.

Methods: In order to study the effect of the yarn structure on the wettability properties, 3 PET yarns characterized by same 90 μm equivalent diameter were considered: (1) monofilament, (2) multifilament, (3) staple yarn. A yarn surface was obtained by winding each yarn around an oblong support in a way to get contiguous spires and limit gaps between threads. A specific testing apparatus was developed to measure the contact angle of a drop of water placed under pressure on the tested surface. The goal was to reproduce the physiological blood pressure conditions. In a second approach, woven constructions were obtained from the same yarns in order to investigate the effect of the yarns arrangement on the wettability. At last, the roughness of the yarns integrated in the woven surface was modified and contact angle was measured.

Results: Results bring out differences among the yarns which were used. In particular it could be pointed out that differences depend on the pressure applied to the drop (fig.1). Considering mono and multifilament, it appears that multifilament is slightly more hydrophobic than monofilament when no pressure is applied. Conversely, under pressure, multifilament yarn becomes more hydrophilic as can be seen in the figure (fig.2). Actually, under pressure the multifilament structure undergoes local rearrangement. Similar observations could be made at fabric level.

Conclusion: These preliminary results confirm that it is possible to adjust the wettability of a fabric surface by setting the topography at yarn and fabric level. Fibrous constructions can thus be optimized in order to limit fibrotic tissue ingrowth.

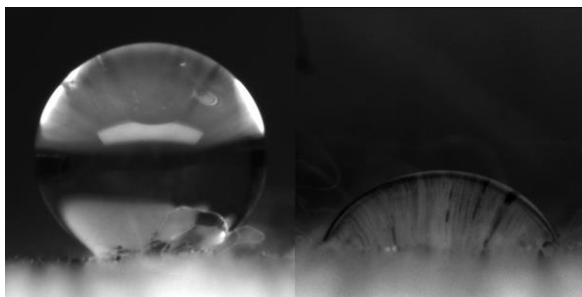


Figure 1: drop of water on multifilament before and after apply a pressure

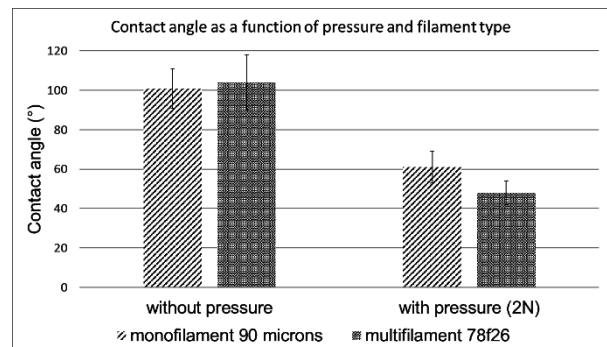


Figure 2: Contact angle of multi and monofilament