Geometry Matters: Unveiling Tampon Absorption Mechanisms

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Feminine hygiene products, an integral part of daily life for millions of women worldwide, encompass a diverse range of options. Among these, tampons represent a widely used choice for managing menstrual hygiene. Despite their widespread use, the intricate mechanisms governing liquid absorption in tampons have long remained unclear and received only limited research attention. This study takes an attempt to explore these mechanisms by investigating the critical role of fibre geometry in tampon absorbency.

Two main types of viscose fibres, round and trilobal, are central to this investigation. These fibres share nearly identical chemical compositions (XPS), fine structure (WAXD) and mechanical properties (DMA Tensile test), yet they exhibit significant differences in tampon absorbency. Trilobal fibres, characterized by their distinctive geometric shape, outperform round viscose fibre in liquid absorption measurements, e.g., the syngina test.

This intriguing revelation prompts a closer examination of the factors at play. Single fibre swelling exhibited disparities between the two fibre types, shown by water retention values and surface characterizations (iGC). Although, the higher specific surface area of trilobal fibres encourages enhanced liquid uptake through fibre swelling, it is not the primary driver of the absorbency difference between round and trilobal fibres. Instead, the geometric shape of the fibres emerges as the pivotal factor. Trilobal fibres create and maintain a bulkier, more expansive network within the tampon, providing a larger available volume for liquid absorption. In summary, the geometric shape of the used fibres, rather than single fibre swelling, stands out as the key factor driving the absorbency difference between round and trilobal fibres, with potential implications for tampon design and performance improvement.