

BEYOND THE DREAMS OF THE AMAZONIAN INDIANS...

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WITH ARKOPHOB[®] FFR, ARCHROMA HAS INTRODUCED PROBABLY THE MOST EFFECTIVE WATER REPELLENT SOLUTION AVAILABLE ON THE MARKET TODAY - BASED ON FLUORINE-FREE CHEMISTRY.

The use of clothing to protect from the elements dates back to the dawn of civilisation. As early as the 13th century, Amazonian Indians were using the milky substance extracted from rubber trees for waterproofing items such as footwear and capes, and even today, many manufacturers employ rubber-based compounds as the basis for technical textiles.

Macintosh and Oilskins

By the 18th century, fabrics were waterproofed with rubber by more sophisticated methods but remained difficult to wear. If the weather was hot, the clothing became supple and tacky and if cold, was hard and inflexible. This problem was solved in the early 19th century by Scotland's Charles Macintosh, who dissolved rubber in naphtha, making a liquid which could be brushed onto fabric to make it both waterproof and more adaptable to temperature changes.

The origin of oilskin or waxed cotton clothing also dates back to the 18th century, when sailing ships were still rigged with linen sails. Fishermen and sailors discovered that applying linseed oil from flax seed to the linen made effective waterproof items. The linen, however, was heavy and the linseed oil turned yellow and stiffened over time. Cotton sails eventually replaced linen, since it was lighter and could be woven into a tighter stronger fabric. It also led to lighter and stronger clothing such as oiled cotton jackets, coats and trousers.

Chemically-treated fabrics had started to predominate by the early 20th century and in the 1940s, military research led to the creation of raincoat fabrics that could be dry-cleaned. Vinyl was a preferred fabric in the 1950s for its impressive waterproofness, as was plastic, through to the 1970s, though such raincoats retained heat. Wool blends and synthetic blends that could be machine washed were then regularly used to make raincoats from the 1950s.

Another development of note – again initially originating in Scotland – was the impregnation of cotton fabrics with paraffin wax to produce effective and breathable waterproof clothing. This is still popular today for both outdoor country pursuits and high-end motorcycling gear.

However, wax and cotton are both natural products, and unfortunately this is their chief limitation, in that they decay and their effectiveness in combination is greatly reduced over time. As a consequence, they cannot be stored where there is moisture and after a time have to be rewaxed.

Fluorocarbon emulsions

The development of fluorocarbons represented the next significant breakthrough in water repellent coatings, with fluorocarbon emulsions far out-performing the characteristics of silicones and waxes. They provided functionality at much lower levels of application and resulted in lighter and more comfortable garments while considerably reducing costs for manufacturers. Beside outstanding water repellency, further attributes like oil repellency, stain and soil resistance, or stain and soil release properties, have been implemented and are nowadays well recognized valuable properties.

The established production route for fluorocarbon emulsions, however, C8 technology, while being highly effective for both advanced water and oil repellent finishes, relies on fluorotelomer products which may contain trace levels of PFOA (Perfluorooctanoic acid) – a long-chain perfluorinated compound.

PFOA persists in the environment and, while not banned, its effect on the environment and wildlife has been under significant scrutiny. As a consequence, many retailers have announced changes in the materials used to produce their clothing.

Archroma, however, introduced next generation PFOA-free fluorochemical alternatives as early as 2006. Since over a decade ago, working with the US Environmental Protection Agency (EPA), Archroma was one of eight chemical companies who voluntarily participated in the 2010/2015 PFOA Stewardship Program targeting to remove PFOA, even as an impurity, from products.

The company's safe and effective short-chain alternative products are based on the latest C6 fluorotelomer technology, which eliminates PFOA even as a product impurity, but yet offers all attributes of the conventional C8 based fluorochemistry. However, when the focus is primarily on water repellency another further sustainable alternative chemistry has been developed. With Arkophob[®] FFR agent, we believe we have come up with probably the most effective solution available on the market today.

Performance

Arkophob[®] FFR brings together a fluorine-free technology and the highest water repellence performance.

Its carefully-selected active ingredients and their special formulation facilitate efficient application and allow a durable and even film formation on the surface of the fabric, resulting in a number of benefits.

Arkophob[®] FFR has been extensively tested by Archroma experts in respect of its water repellency, in addition to its wash permanency and the softness or 'hand' of

the resulting fabrics. In addition, the agent has a positive effect on the abrasion resistance and tear strength of the fabrics.

In spray tests on 100% cotton twill fabric, Arkophob[®] FFR clearly outperforms other fluorine-free products in terms of water repellence, and its performance is very close to C6 fluorocarbons.

Ironing is not necessary for recovering the water repellency after laundering, but would slightly improve the effects (as also known from fluorocarbons).

Not only this, the product has been proven to retain its performance, displaying a resistance of more than 20 washes, again making its performance close to that of C6 fluorocarbons and far superior to other fluorine-free products.

Application conditions for figure 1:

Dosage:

100 g/l product

Process:

Pad-dry-cure (pickup 70%,

Dry/cure 30 seconds real

Dwelling time at 175°C)

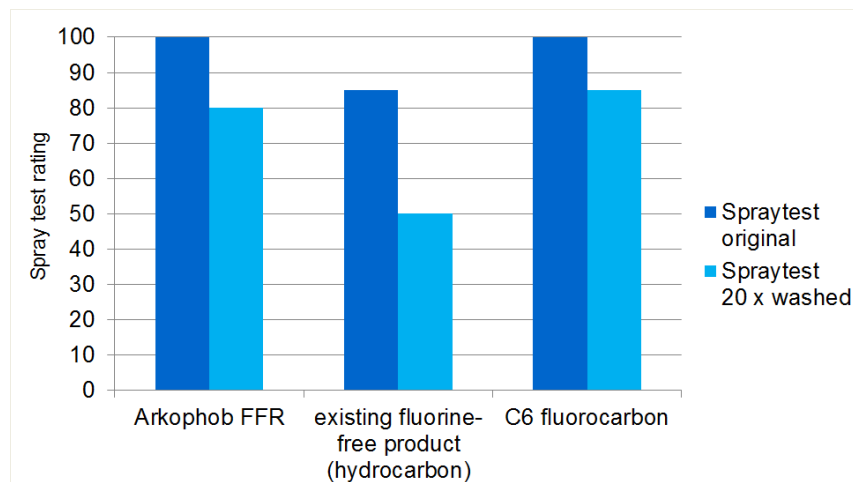


Figure 1: Performance on 100% Cotton twill. Water repellency by Spray test (AATCC 22)

It must be stressed that the new product is solely for water repellency and that to date oil repellency can only be achieved with fluorocarbon products. If required, Archroma's C6 chemistry-based, PFOA-free* fluorocarbon products in the Nuva[®] range should be selected.

Application conditions for figure 2:

Dosage:

100 g/l product

Process:

Pad-dry-cure (pickup 70%,

Dry/cure 30 seconds real

Dwelling time at 175°C)

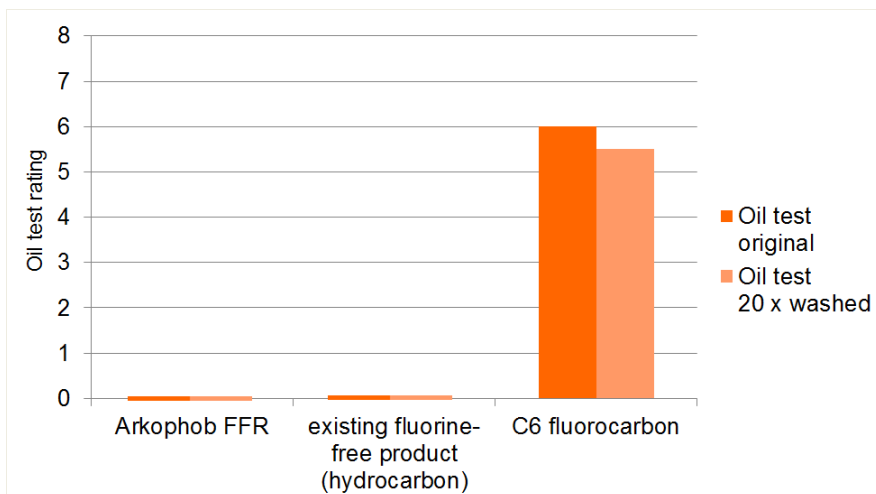


Figure 2: Performance on 100% Cotton twill. Oil repellency by Oil test (AATCC 118)

Another considerable benefit is that, being a hydrocarbon-based chemistry, Arkophob® FFR allows a much softer hand feel to the fabric compared to fluoro-based treated fabrics or untreated fabrics.

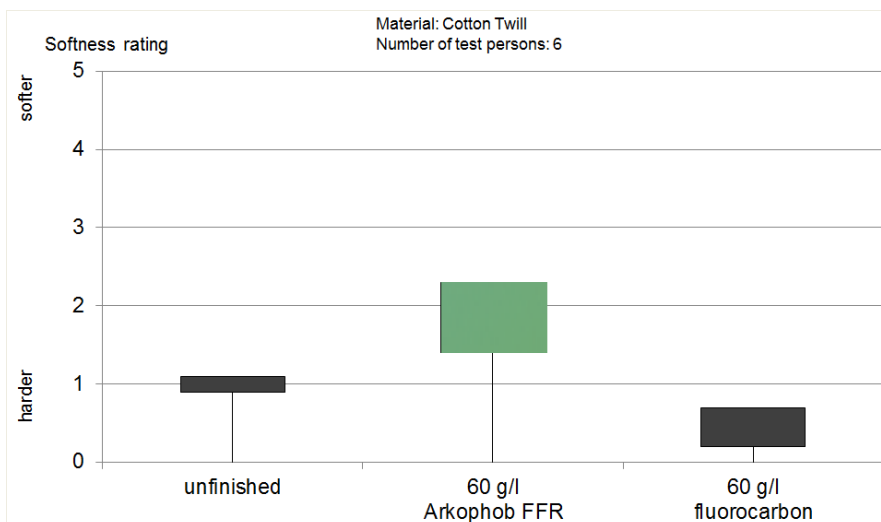


Figure 3: Softness tested by handle-test (comparison by pair)

Add to this a better resistance to abrasion and tear, improved sewability (see graph 4), no impact on breathability of the fabric and the result is an extremely convincing new technology that can improve the performance of fabrics used in a wide range of outdoor, leisure and sportswear applications.

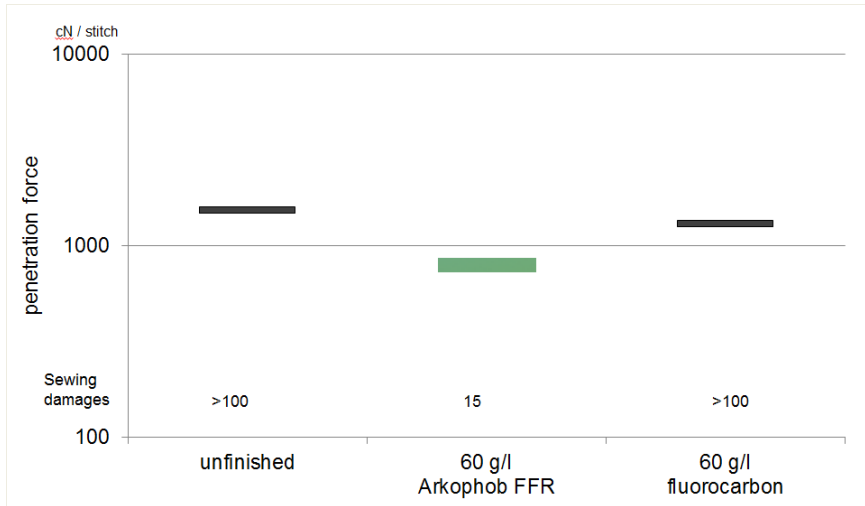


Figure 4: Arkophob® FFR – Influence on sewability of Co tricot

Another advantage of this new product is that it causes practically no yellowing on white fabrics – unlike to some other products on the market (see graph 5).

Application conditions for figure 5:

Process:

Pad-dry-cure (pickup 70%,

Dry/cure 30 seconds real

Dwelling time at 175°C)

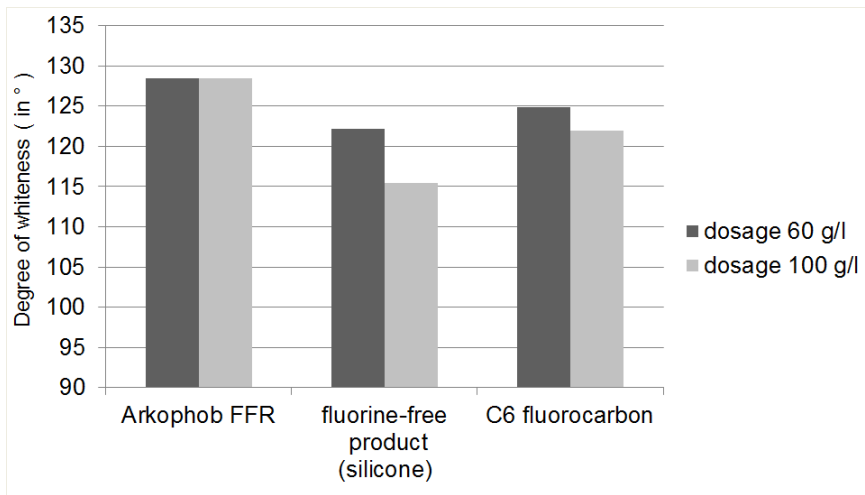


Figure 5: Performance on 100% cotton twill. Influence on whiteness

Arkophob® FFR is part of Archroma’s on-going commitment to assist brands, retailers and textile producers in adopting more sustainable operations and processes.

Archroma’s Textile Chemicals is committed to developing products and processes that are safer and gentler for the consumer and for the environment, and with Arkophob® FFR we have achieved that, in addition to a leap forward in performance.

We perfected the Arkophob[®] FFR technology over several years, to ensure we were able to introduce a differentiated solution that delivers what it promises to retailers and brands.

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