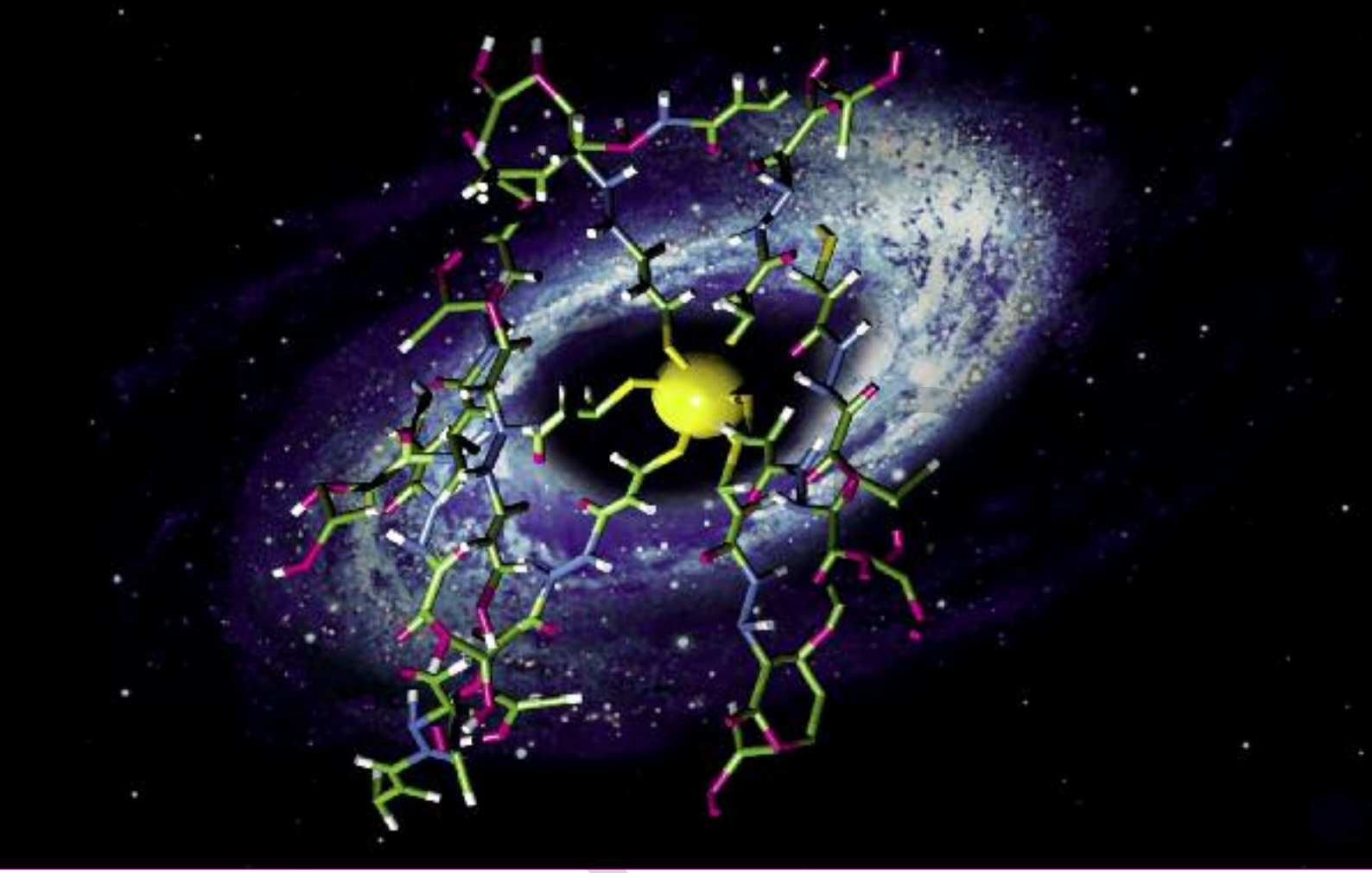
From moisturising and slimming to healing, performance textiles are experimenting with new ingredients and techniques, opening the way to an emerging family of therapeutic textiles.



Encapsulating the future

Promoting healthy skin is the catchword of a series of recently developed fibres. At the start of 2011, Lenzing launched Tencel C, a lyocell fibre enriched with chitosan, a biopolymer extracted from the shells of crustaceans. Widely used in cosmetics, the substance, a polysaccharide, is said to alleviate itchiness, activate cell regeneration and provide skin protection as well as antibacterial action. While chitosan makes up less than 1% of the fibre's content, Tencel C acts like a moisture reservoir to optimise skin moisture, according to Lenzing. Blind tests have shown that wearing Tencel C stockings, compared to cotton stockings, improves the smoothness of skin. Lenzing's fibre is similar both to Pozzi Electa's aptly named viscose/chitosan fibre Crabyon and Smartfiber's Seacell, a cellulose fibre with seaweed extracts.

Two fabric suppliers, Arula Textile Solutions (formerly Huber Tricot), in Austria, a maker of cellulose-based knit fabrics, and Tejidos Royo, a Spanish denim manufacturer, presented the first Tencel C fabrics. Tejidos Royo is marketing the denim fabrics under the "Daily Spa" banner to tap into the growing demand for wellness products.

Polyamide producer Nylstar promises younger-looking skin with its latest innovation, Nylgold, which claims anti-ageing, anti-oxidant and moisturising properties. The polyamide 6.6 fibre possesses a 24-carat gold nanoparticle core that binds hyaluronic acid (HA) molecules to the fibre. Hyaluronan is considered a natural substance - because it is produced by the human body - and is used in cosmetics. In tests, the fibre emits 0.6% of the nanoparticles over a period of 48 hours releasing the HA molecules directly to the skin, according to Raúl González, Nylstar's international marketing manager. "There are 4.5 billion HA nanoparticles per cm^3,

Nylgold by Nylstar is based on a gold nanoparticle core that binds hyaluronic acid molecules to the polyamide 6.6 fibre.

Nylstar

which means the garment will be effective for 386 washes," he explains, adding that the microfibre has a smooth and soft hand.

Nylgold is currently available in 33dtex/34 filaments count and Nylstar recommends 40% content to achieve best results; but this comes at a cost, since the deluxe gold fibre is ten times more expensive than conventional nylon. First presented at the end of 2010, the polyamide fibre producer, based in Blanes, Spain, is still looking for a major lingerie or wellness brand to launch the concept globally. In the meantime, Raúl González says hosiery, shapewear, nightwear, sportswear and bedding companies are currently preparing to market finished products.

Calling on essential trace elements

While gold hits the right note in the luxury and beauty environment, other companies are promoting copper and zinc for their ability to boost the skin's natural regeneration functions.

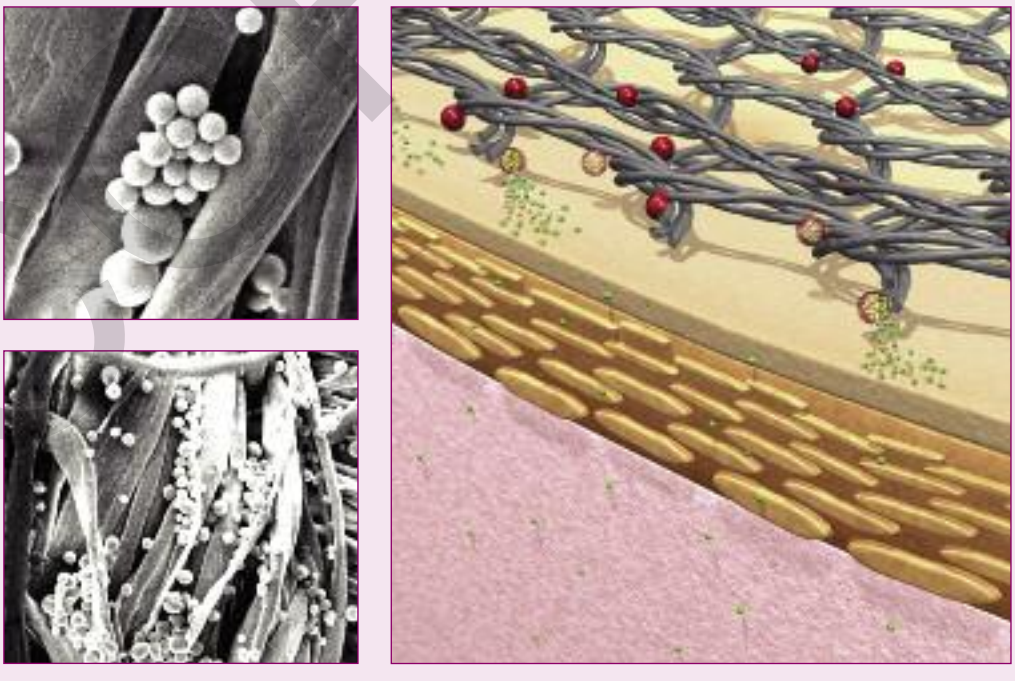
According to research conducted by the copper fibre specialist Cupron Inc., the essential mineral stimulates production of capillaries and collagen that help improve the look and appearance of skin and could promote wound healing. These functions add to copper's known ability to kill many species of bacteria, fungi, viruses and dust mites. The Richmond, Virginia, based fibre producer integrates copper oxide into several types of polymers, including PBT, PET, polyamide and polypropylene. Copper makes up 1% of the fibre content, sufficient to ensure efficiency without modifying the fibre's physical properties, according to Dr Gadi Borkow, the company's chief medical scientist, adding that tests on Cupron fabric pillowcases have shown a statistical reduction of wrinkles. "Copper ions are released to the skin in a humid environment, meaning the more you sweat the better the skin will look and feel," he says. Cupron is said to remain efficient for up to 100 wash cycles. Dr Borkow is currently investigating possible medical applications for the fibre, including wound healing. He also says that anti-viral influenza medical masks are already available, though still being tested.

Zinc is yet another mineral with potential health and beauty care properties. It is the active ingredient found in the recently launched Smartcel Sensitive lyocell fibre produced by Smartfiber in Rudolstadt, Germany. According to company documents, the trace element may enhance the body's defences against infection as well as heal inflammation and wounds. Speaking at the TechTextil show in Frankfurt in May 2011, Thomas Daue, Smartfiber's North American sales director, explained that zinc oxide is currently a good alternative to silver, whose price has skyrocketed and he believes may have potential harmful side effects in nano-form. "Zinc is considered a safer option because it is commonly found in cosmetics and food," he said. "Once inside the fibre, it is easy to dye and can even be bleached." He added that zinc is also an effective antibacterial agent at low concentrations, between 8 to 10% of Smartcel Sensitive content.



Cupron Inc. markets the anti-ageing properties of its copper fibre in pillow cases, gloves and eye masks to wear when asleep.

Cupron Inc.



Clariant and Lipotec have introduced a lipid-based chemistry called Quiospheres said to distribute the microcapsules evenly across the fabric.

Clariant

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In apparel applications, whether lingerie or sportswear, brands require high colour brightness and fastness, an area where some of these beauty and health boosting fibres have drawbacks. In some instances, silver ions can blacken the skin. The beige yellow colouring of Cupron requires the fibre to be covered with another to obtain a pure white tone. As for gold and zinc, they appear to present few limitations with regard to dyeing and finishing.

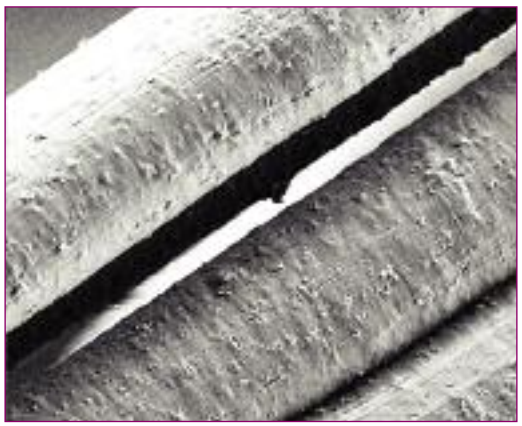
The active beauty ingredient can also be made deliberately visible, an option chosen by French cosmetotextiles company Royal Thermes for its newest range of anti-cellulite Sveltesse bodywear, launched in September. A network of raised dots made of a tourmaline-based bioceramic compound is strategically placed at the hips and waist of the garments. The "tourmaline micro-crystals", as Royal Thermes calls them, are said to reflect far infrared radiation, which activates blood flow and may help reduce cellulite by improving skin texture. The company sources the product from Rhodia Brazil, the maker of Emana, a polyamide fibre enhanced with bioceramic particles.

Cosmetic chemistry

Another series of recent developments is exploring new ways to apply cosmetics and even medication to textiles.

At ITMA in Barcelona this autumn, Swiss chemical company Clariant launched Quiospheres, a process developed in partnership with Spanish cosmetics ingredients manufacturer Lipotec. In 2010, Lipotec introduced Qiosels, a finishing process based on liposomes coated with a cationic polymer that bonds the active ingredient to a textile. Without effecting the handle of a fabric, the new Quiospheres technology presented by Clariant is based on Lipotec's system. The two companies are offering two cosmetic functions: slimming or moisturising. According to Clariant, the release of the ingredients is scientifically measured and continues for an extended period of time. The microencapsulated fabric is said to remain effective through 20 wash cycles.

High-end Swiss textile manufacturer Schoeller has also recently introduced a cosmetotextile concept under the iLoad label. According to its CEO, Hans-Jürgen Hübner, the technology uses a lipid carrier to provide active wellbeing ingredients to the skin. After experimenting with several possible techniques over the course of eight years, the company came to the conclusion that "all existing techniques, whether microencapsulation, cyclodextrins or sol gel, weren't long-lasting enough", according to Christine Hübner, chief relations officer at Schoeller. iLoad is based on a concept Schoeller calls a "donor layer", which has a negatively-charged nanofinish to which a positively-charged emulsion is applied.



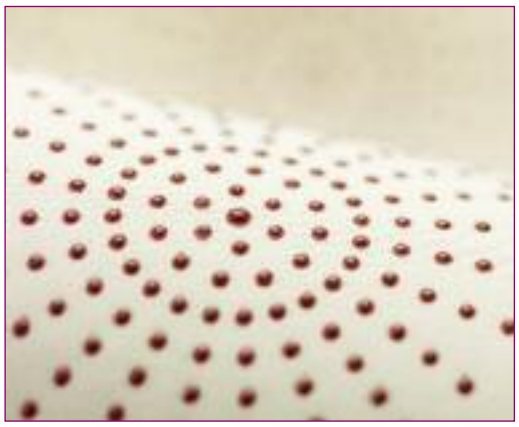
After Seacell, which has seaweed extracts, Smartcel has recently introduced Smartcel Sensitive, a cellulose-based fibre containing zinc.

Smartcel

Variations in humidity levels, temperature or friction release the active substance, which can be a skincare product, a wellness function or even prescription medication. The substance can be engineered to "unload" its ingredients in a short time span, for competition wear for example, or over a longer period of time, for sleepwear. "Every element can be programmed," says Christine Hübner, adding that the finish is invisible and doesn't alter the fabric's handle.

Any type of fabric can be treated to be the "donor layer", which must be worn next to the skin for maximum efficiency. But, and this is the new twist introduced by Schoeller, the fabric needs to be reloaded after each wash. This implies the active participation of retailers - who will need to sell the additive to be put into the washing machine - and consumers, who must accept the idea of recharging their functional garments at every wash.

Having mastered the chemistry, Schoeller is now seeking partners to market the concept. "We are looking at three specific areas: cosmetotextiles, sportswear and medical applications," says Christine Hübner. Schoeller also plans to license the concept to other companies, as it does with 3XDry. The company has recently invested in a fully fledged laboratory, iLoad being the first product to come out of the new lab.



Sveltesse anti-cellulite tourmaline-based bioceramic particles are applied in dots on strategically placed locations.

Royal Thermes

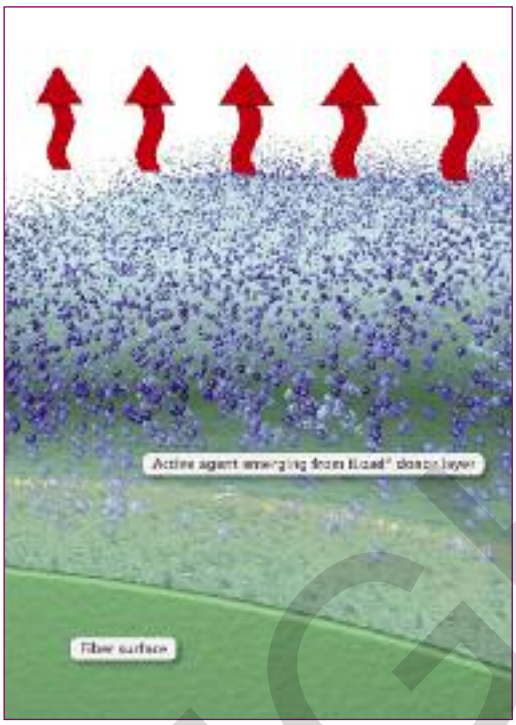
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Pain relief textiles

Beauty and health care textiles based on microencapsulation techniques are making progress. Robert Blondel SA, a leading French supplier of microcapsules, has recently filed a new patent making the process longer lasting. Headed by Yann Balguerie, the company has ceased its dyeing and finishing activities to focus exclusively on microcapsule-based technologies, covering the chemistry to finished garments.

Among the company's many projects, shapewear has the strongest potential according to Mr Balguerie, who is working on combining cosmetotextiles with body mapping and compression knitting techniques. The company is also experimenting with pain relief functions that could be used in compression wear or for support bands for ankles, knees or elbows. Robert Blondel is currently testing ibuprofen-filled microcapsules that would transfer the anti-inflammatory medication directly to the body without going through the digestive system. "The ibuprofen molecule is free to use," said Yann Balguerie who is planning to introduce the new product in North America by the end of 2012.

From fibre to finish, manufacturers of beauty and healthcare textile technologies and solutions are exploring many different options. What remains to be seen is how companies will address the regulatory issues raised by textiles promising therapeutic properties.



Schoeller's iLoad concept is based on a "donor layer" coated with a negatively-charged nanofinish to which a positively-charged emulsion is applied.

Schoeller

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