

## NANOTECHNOLOGY

### Polymer nano trick to fight ageing

by Cath O'Driscoll

US scientists are looking for funding to develop an approach based on nanotechnology that they say could prevent facial wrinkles from ever developing. They hope to develop an implant or other delivery methods for nanoparticles that will keep skin plump.

The team of researchers led by Ilsoon Lee at Michigan State University initially developed the technique to prevent polymer double layers from buckling. They hit on the idea of using the same method to keep skin wrinkle free because of the similarities between two-layer polymer systems and the two layers of dermal and epidermal tissue that make up human skin.

The same underlying systems of wrinkling apply to both the polymer layers and the skin layers,<sup>1</sup> according to Ilsoon. But skin is a living tissue and vastly more complex than a polymer film. The challenge now, he said, is to find materials that are biocompatible but retain the properties used to prevent the polymers from buckling and that can be absorbed or embedded in human skin.

Our research may lead to the development of a new cosmetic product or even a new type of implantable device to prevent this wrinkling,<sup>1</sup> Lee said. This could take the form of either a new topical skin lotion or a biocompatible nanoparticle scaffold that could be overlaid on the underlying skin dermis during cosmetic surgery procedures, he envisages.

Wrinkling in both polymers and human skin occurs as a result of the build up of compressive forces in the plane of the underlying layer of substrate or tissue. These forces are produced as a result of thermal expansion and cooling during polymer processing, or due to prolonged muscle use that occurs over time as our facial expressions change.

In the case of polymers, Lee and colleagues have used silica nanoparticles to break up and redirect these forces out of the plane of the polymer film, he explained. The nanoparticles in the film allow it to be a "stress-releasing" film within the film layer without affecting neighboring layers.<sup>1</sup>

The Michigan team used nanoparticles to prevent thin films of poly(dimethylsiloxane) substrate, coated with polyelectrolyte, from buckling while being processed an effect that should prove useful for developing small-scale electronics devices (Nano Letters, doi 10.1021/nl062544q).

Two proposals to study the concept in human skin are now with the US National Science Foundation, while Ilsoon also plans to approach some of the major cosmetics companies for funding.

While not directly or immediately useful, said Chris Flower, director general of the UK's Cosmetic, Toiletry and Perfumery Association (CTPA), the method does open up some new possibilities: Skin has very different properties and is much more complex compared with polymers, but unless people do start thinking in different ways like this who knows?<sup>1</sup>

Using nanoparticles in cosmetics is not unprecedented. Several anti-wrinkle creams already use nanoparticles to deliver nutrients deeper into the skin. But this new technology should prevent wrinkles from ever developing in the first place.

Consultancy firm Kline said that nanoparticles represent about half of the market for personal care delivery systems in the US and Western Europe, estimated at between \$120M and \$150M.

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