LIGHT TOUCH MATTERS

THE PRODUCT IS THE INTERFACE

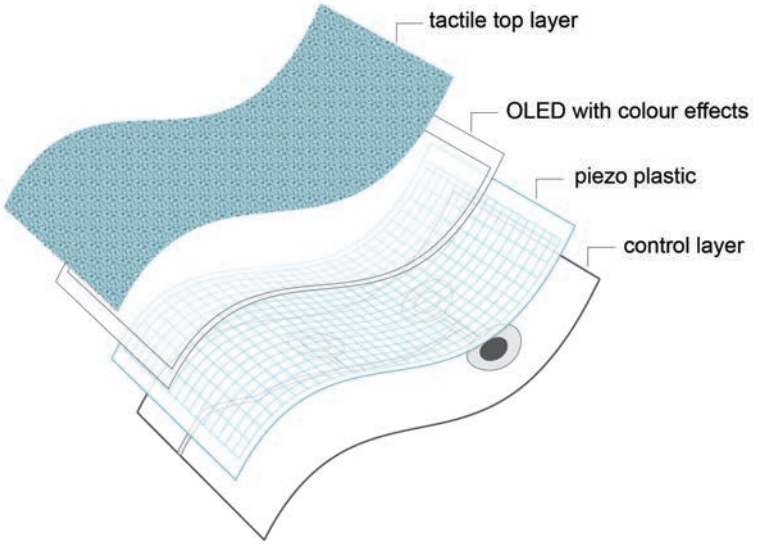
by Mark Miodownik
and Erik Tempelman

What if objects had a sense of touch? What if they could respond to your touch and light up anywhere on their surface, interacting with you in a variety of ways?

What if they could be flexible – and affordable too? Such smart products would have a variety of applications, but they would do more than that: they would change the way we interface with our urban world, making it more responsive and life-like.

In the EU-funded research project Light. Touch.Matters, we are working on achieving this goal. We are developing a fully new generation of smart materials that combine touch sensitivity with luminescence. These 'light touch materials' promise to revolutionize interface design so that the product can literally become the user interface, making separate buttons and screens redundant.

As befits a potentially revolutionary technology, we are using a innovative design methodology. Instead of developing the material and then handing it over to designers, we are letting designers lead the materials development. To do so, our consortium brings together materials scientists and engineers with eight leading European design agencies. Our academic competence spans the full range from product design to materials science to innovation methodology, including renowned academics such as Roberto Verganti and Pim Groen. Completing the team are various other cross-disciplinary partners, including Material ConneXion Italia and Lidewij Edelkoort's trend-watching studio. Together, these 17 partners will venture into design-driven material innovation. The work will be design-led, but materials-anchored. Our designers will inform and re-prioritize the materials-related work, while our material scientists will inspire the designers. Much like in a dance, we expect it'll be hard to tell who is leading whom from time to time, but we predict that like all



good dance partners, these two sides will at least need to give each other sufficient space to perform before returning to a tight embrace.

The core of our new smart materials technology is a remarkable breakthrough made recently at Delft University of Technology in the field of 'piezo plastics'. Piezo-electric materials are a special class of smart materials that turn pressure into voltage, and vice versa. You may not know it, but they are all around you: in your cell phone (buzzer), your gas lighter (spark) or in your car (parking sensor). Their key drawback? Being ceramic, they are inherently brittle, and hard to integrate into products. But by putting tiny piezo-active particles into a polymeric matrix and applying some smart manufacturing tricks, we can create a composite that combines the best of both worlds: piezo-active, yet flexible, rugged and easily integrated into products.

The innovative LTM piezo composites aim to overcome the typical drawbacks of most existing piezo plastics: they are expensive and they do not feature resistance to higher temperatures, which complicates their integration into specific product types.

For response, we will put another new material on top, or rather, a device: a flexible OLED. So-called 'organic light emitting diodes' have been around for some time now, and researchers all over the world are working to make these devices cheaper, more efficient and above all, flexible. Few R&D groups are as far as the Dutch Holst Centre, one of our partners. We will use the OLEDs for what we call 'signage', i.e. to light up logos, use cues and other small luminescent elements. Not only does this combine well with the piezo plastics, but it is also an application area largely ignored by big players, who focus on large-area lighting and displays for smartphones, tablets or TVs. Of course, touch-sensitive displays already exist. However, they are expensive, fragile, consume a lot of energy and – perhaps crucially – the really smart ones can only be made by a handful of companies. Our new materials will have as few of these drawbacks as possible. Our aim is to make touch interfaces simple and easy to integrate into products, perhaps covering the whole of their surface.

Together, piezo plastics and OLEDs are not yet a smart material. That requires control circuitry as well, but this is available off-the shelf. In our project, we will work to integrate all of these elements, developing several 'technology demonstrator' products that showcase what the new materials can do.

Our ideal of rich interaction[1] stimulates us to optimize the look & feel of the new materials. So, we will give specific attention to tactility and the colours and 'texture' of the actual light they give off. One domain where this is of key importance is that of care and well-being, in other words: all those products we deploy to monitor our blood pressure, use to revalidate after surgery, and so, plus more autonomous gizmos that remind us when to take pills or alert the doctor if we fall. But we see a bigger role for our materials in helping an increasingly technological world more navigable for elderly, infirm or the disabled.

1. J.W. Frens (2006): Designing for rich interaction, Eindhoven University of Technology, the Netherlands

This project sits within an emerging trend where 'material' and 'product' begin to merge, with the boundaries between the two getting blurred. As science writer Philip Ball remarked in his introduction to the 2006 reprint of J.E. Gordon's classic work "The New Science of Strong Materials":

"Today's new science of materials looks not only for strength but for flexibility, hardness, elasticity, electrical conductivity, adaptiveness and responsiveness."

Well said! If we factor in recent developments in self-healing materials, you may wonder if perhaps we will soon be living in a world in which all materials have become smart, instead of the jungle of 'dumb' objects we inhabit today, smartphone in one hand and tablet in the other. But product designers should then assume new roles and responsibilities. Setting specifications for the new 'smart stuff', finding applications that make sense, and do so in a feedback loop that is effective and efficient, that may very well become their new job. Just consider: between the first high-quality seamless steel tubes of the 1880s (Mannesmann, Germany) and the first designer chairs to use these new materials in the 1920s (Marcel Breuer, Wassily Chair, 1925) there was a gap of half a century. With our design-led methodology we aim to innovate a bit faster. Follow our progress here: **light-touch-matters-project.eu**

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