Cao and co-workers demonstrate that when aligned into line patterns on Si_3N_4 substrates and transferred to polydimethyl siloxane polymer films, these superparticles exhibit a higher polarized emission (polarization value of 0.88) than that for single nanorods (approximately 0.75; refs 3,6). Such emergent behaviour can be partially attributed to environmental dielectric effects, but also hints to a collective dipole coupling between the nanorods.

Cao and colleagues' superstructures are therefore of practical relevance. Resulting from an exquisite control of the synthesis, they are also a tour de force of the possibilities of bottom-up self-assembly. Moreover, the researchers' approach extends the principles of supramolecular chemistry into the nanocrystals domain and demonstrates how non-specific interactions in colloidal systems can be used together with thermodynamic and kinetic principles to balance attractive and repulsive forces on multiple length scales. Indeed, that simple thermodynamic concepts can be used to predict the architecture of complex superstructures exemplifies the possibilities of (supra) nanocrystal chemistry. ❒

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MATERIAL WITNESS

PEELING WITHOUT PAIN

PHILIP BALL

Do you grit your teeth and yank, or try to peel gently? Either way, there seems to be no pain-free way of removing a sticking plaster, which is apt to bring hairs and who knows what else with it. But whereas the trauma is trivial for a grazed knee, removing medical adhesives can be a serious problem in other circumstances, particularly when they are applied to the skin of premature babies (which lack an epidermis) or elderly people (where the skin is thinned and poorly anchored). Wound dressing and attachment of medical devices in such cases is therefore fraught with difficulty and danger.

Approaches that weaken the skin/adhesive interface might lessen the damage to skin only at the expense of making attachment less secure. More sophisticated release procedures could make removal impractically slow in a medical setting. Laulicht *et al.* now offer another solution: to decouple attachment and detachment. They have devised a medical tape that is 'removed' by stripping off the backing layer while leaving the adhesive itself in place on the skin (B. Laulicht, R. Langer and J. M. Karp, *Proc. Natl Acad. Sci. USA* http://doi.org/jpw; 2012). The backing can be peeled off with a relatively low force, while retaining a high shear strength so that the tape won't easily be pulled away inadvertently.

The entire basis of sticky-tape-type adhesion relies on the distinction between the area-dependent adhesive force and the fact that peeling is controlled by a line tension at the edge of the adhesive/substrate interface, where in effect a two-dimensional crack propagates. This makes attachment secure but reversible: a taped-down device can't be pulled off without detaching a large adhesive area at once, but the tape can be peeled off with only modest force.

All the same, the skin may be deformed, and some of it removed, as conventional medical tape is peeled away. By engineering the interface between the adhesive and backing, Laulicht *et al.* allow the latter to be peeled off quickly and easily. This interface is mediated by a 'release liner' layer: a submicrometre-thick film of silicone microscopically etched with a laser into adhesive and non-adhesive domains, the size and shape of which determine the release properties.

The researchers use a polyethylene terephthalate backing layer (a proprietary medical-tape plastic works too) and an acrylate-based adhesive, united via a release-liner layer micropatterned to bring various proportions of the backing into contact with the adhesive. Provided that these contact domains are less than a millimetre in width, the adhesive and backing will separate cleanly when the backing is peeled away, leaving an undisturbed adhesive layer on the skin. The precise peeling force depends not only on the contact area but on the shape of the domains — lines or grid squares, say.

Acrylate adhesives are widely used for medical tape, and some commonly remains stuck to the skin when the tape is removed, without adverse dermatological effects. But in any case Laulicht *et al.* choose this layer to be thick enough that it can be rolled up and removed by gentle rubbing with a finger. If the skin is too fragile even for this, the adhesive can be rendered non-sticky with talcum powder. It works well enough on delicate origami paper; as ever, clinical trials will be the real challenge. ❒