



New Products Update

In this issue of Engineering News & Views, we announce the availability of a bumper crop of important new products – including that Holy Grail of materials an affordable shape memory polymer (SMP). First of all, we report on two unique publications – the first of which is free to all TR/TEP customers.

Once again, it is good to know that students and pupils are now enjoying equal access to resources that stretch the imagination of professional practitioners. The newer smart materials are especially suitable for A-level students seeking novel solutions to old problems or creating products inspired by the novel properties of the materials themselves. An ideal strategy for A level course leaders might be to get together a handling box or sample box with as many of these key resources as possible for students to experience.

Eureka!

This publication, previously called Engineering Materials & Design, is familiar to professionals as the popular source of information on new materials, inventions and innovations. Appearing monthly, it contains a wealth of fantastically illustrated information – appealing to lay readers as well as specialists. The most interesting articles are extracted for an education audience to create three issues of Eureka on Campus yearly. By special arrangement with TEP, this is now available to schools and will be packed free of charge with any order dispatched by TR. We hope that Eureka will help colleagues to keep abreast of leading edge developments in product design and manufacturing and provide inspiration for pupils.



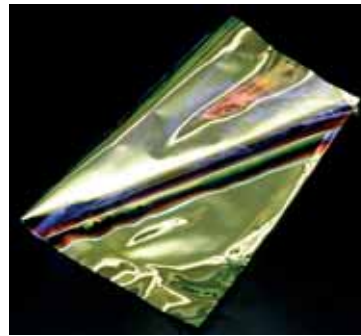
Ingredients

The first thing to say about this 74 page full-colour book is that it has nothing to do with food! Ingredients is a metaphor for resistant materials and their innovative combination. The author, Chris Lefteri, is the UK's leading exponent of new materials in product design and has written the definitive Rotovision series of books – some of which are also available from TR. Ingredients was commissioned to accompany the major international materials exhibition at Earl's Court this year and TEP has secured an agreement with the publishers to distribute it in schools at virtually cost price.

The book features an astonishing mix of new materials and applications, and has become a 'most wanted' book by students studying anything from fine art to engineering product design. The chapter headings speak volumes: 'Fabric in a Can'; Weird Materials; A day in the Life of a London Newspaper; Synthetic Biology, Making it, Intolerable beauty – etc.

Ingredients (single copy) – stock code BB6 280 – £1.25
 Ingredients (10 copies) – stock code BB6 280A – £10.00

Smart Film



The application of decorative films to flat or curved surfaces has revolutionised the look and manufacture of products including mobile phones, perfume packages, artificial nails, sunglasses - and even garden trowels! These films are not normally on offer for student use because they typically use specialised heat bonding equipment and are usually only available in industrial quantities. Now, at long last, we have managed to source one of those amazing films that when applied to a surface causes it to change colour according to viewing angle. And it has a self-adhesive backing as so can be applied by hand.



The patented micro-thickness polyester film actually consists of no less than 250 layers that provide the amazing optical property of 'colour switching'. Applied to a light surface the film 'morphs' from a violet blue to a pinkish red; on a darker surface, it turns from purple to gold. The film can be applied easily to any substrate including card/paper, plastics, and metals – with endless decorative applications. However, the functional uses are also mounting up – e.g., filters for windows and optical products, angular warning systems and even an original form of sundial.

The film is 0.38 metres wide and supplied in increments of 1.0 metres. Please state the total length you require on your order.

Smart film 500 – 380mm x 1Metre
 Non-adhesive – stock code 314-110A – £2.85
 Self-adhesive – stock code 314-111A – £9.00



Shape Memory Polymer (SMP)

In many ways this material is the polymer equivalent of shape memory metal - e.g., smart wire (stock code: PAC SW1). The material is similar in appearance to clear acrylic but is in fact a cast thermo-setting resin with extraordinary memory properties. Most polymers have some 'memory' but this one can be stretched by up to 200% and still remember its original condition. The material is cast to 'remember' that it should be a flat sheet. When heated above 70°C, it softens, and can be shaped by stretching, bending, blowing etc. When cool it retains its new shape, but if the material is re-heated to 70°C, it reverts to its flat sheet condition. Commercial applications include deployable structures, and tooling for industrial manufacturing.

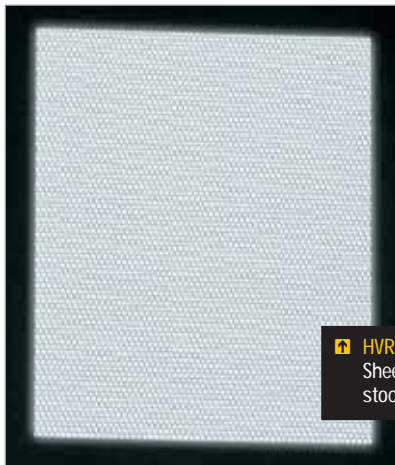
The material can be cut and machined like acrylic and uses in the classroom include both SMP demonstrations and real project applications - e.g., a safety mechanism that provides mechanical movement if fluid or air get too hot.



SMA (sheet memory polymer)
Sheet size approx. 3mm thick x 10cm x 15cm
stock code 234-100 - £4.75

High Visibility Reflective Film (HVRF)

This self-adhesive material is the industry standard film found in applications ranging from high visibility safety clothing to the optical marking of aircraft. The key ingredient of the film is a layer of micron-size glass beads that refract, scatter and reflect almost 100% of the incident light.



The flexible film can be cut with a craft knife or scissors and has potential for student projects involving safety in the home, road safety, design of optical gadgets etc.

HVRF is supplied from a roll 610 mms wide and is sold in increments of 0.5 metres. Please state the total length you require on your order.

HVRF (high visibility reflective film)
Sheet size 610mm x 500mm
stock code 234-139 - £6.00

Black, 6-spoke wheels
stock code CW3 031A - from £0.28 each



Optically clear polycarbonate sheet

This material is distinctive amongst sheet plastics because of its supreme impact resistance and toughness - and is used extensively in applications including:

- architectural glazing
- interior fittings
- safety guarding
- riot shields
- optical & medical instruments

It is not commonly available in smaller sheets and so we hope that the clear optical grade now supplied by TR will help to satisfy needs for small-scale prototyping. Despite its toughness and impact resistance, it can be guillotined, sawn, machined, drilled and thermo-formed very easily.

It is also important to note that the 0.75mm material can be formed cold using simple hand methods or a sheet metal folder - leading to many simple fabrication opportunities. Polycarbonate has another unique property in this respect: because it can be folded and re-folded many times without fatigue. The material 'thins' or necks along any fold line enabling a 3D form to be created and then flattened again prior to re-creation of the same shape or subsequent 3D 're-deployment' - e.g., a small product equipment provided flat packed



Polycarbonate sheet (340mm x 620mm)

Stock Code	Thickness	Price
234-119A (for cold forming)	0.75 mm	£2.50
234-117A	1.5 mm	£4.90
234-116A	3.0 mm	£7.60
234-118A	5.0 mm	£12.90

Black, 6-Spoke Wheels

The new range of polythene wheels provide an additional style that can be used where weight reduction is important - or a more traditional retro-engineered look is needed. (They also look great as flywheels.)

The wheels are 75mm in diameter, 5.5mm in thickness (9mm around boss) with a centre hole to interference fit onto a 3mm shaft. The centre can, of course, be drilled out to accommodate other diameters.

Continued overleaf ➡





New Products Update

Continued

Pure Silk Cloth & Silk Cocoons

One of nature's miracle materials, this has become a whole lot cheaper as sericulture has become a whole lot more efficient. Setting strength against weight, silk is still one of the strongest of any materials apart from spider silk. Considering its origins, it is also one of the most improbable and fascinating. It is still procured by unwinding individual silk cocoons and spinning these into a thread capable of weaving into cloth.

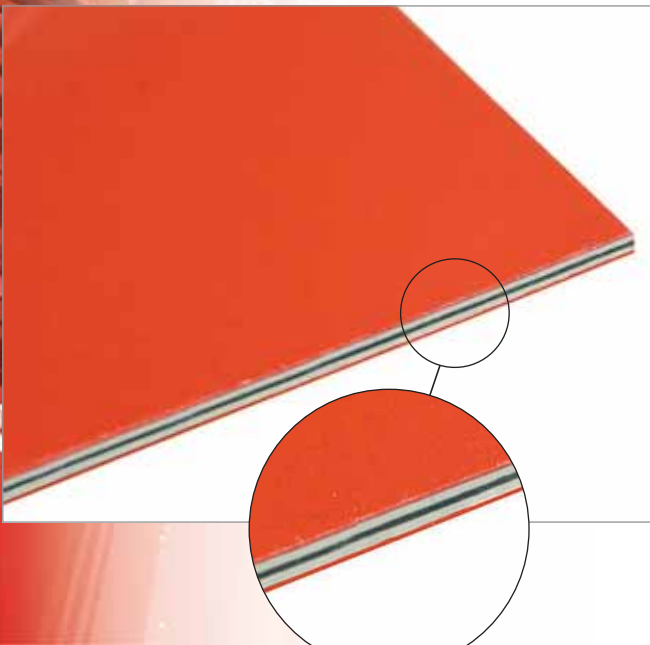
TR can now supply both silk cloth and raw cocoons for those who want to tell a good story about natural materials compared with synthetic ones.

To demonstrate the unwinding of a cocoon, soak one in boiling water for a few seconds (to soften the binding agent) and then pull off a strand with tweezers. One mile later (!) and the whole job is done. Although commercial winding is mechanised, this is still how silk is derived on an industrial scale.

(Note: to improve the strength of silk, spider genes have been introduced into silkworms with promising results. A similar experiment – a goat crossed with a spider - has led to spider silk protein expressed in milk and extracted as an extruded material !)

Engraving Laminate

This is the standard material 3 ply polymer traditionally used for signage. When a single layer is cut through using an engraving or small milling cutter, a different coloured layer is revealed. The material is now extensively used for creative decorative effects.



Engraving Laminate (150mm x 125mm sections)

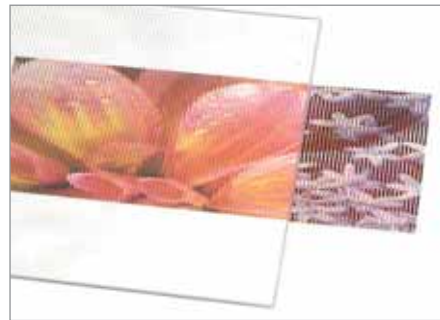
Stock Code	Colour	Thickness	Price
234-112A	Black/White/Black	1.5 mm	£0.80
234-113A	Red/White/Red	1.5 mm	£0.80
234-114A	Black/White/Black	3.0 mm	£1.20
234-115A	Red/White/Red	3.0 mm	£1.20



☛ **Silk cloth** – stock code 314-041 – £2.00 per metre
Silk cocoons – stock code 233-149A – £0.16 each

Animation Plastic (Multi-lens polycarbonate)

This material provides the optical basis for the animation or image switching effects seen on advertising displays (and smaller hand-held cards) as the viewing angle of the observer changes. It consists of optically clear polycarbonate with parallel lenses moulded on one side. The way the system works can be explained with reference to a very simple example. A series of thin black lines are printed on paper so that each line falls exactly under each of the lenses. When the plastic sheet is viewed from the top, the black lines appear through the lenses and the whole area appears black.



If the viewing angle is altered to look slightly sideways at the lenses, they each show clear paper and so the whole image looks white. If you want to switch between two colours – say, red and green - then each of parallel lines lying under the lenses is printed as a red and green stripe. At one viewing angle only the red side of the stripe is seen and the whole area looks red; when the angle is changed, only the green is seen.

To create the illusion of picture switching, two separate pictorial images are divided into narrow stripes and interleaved. Viewed from one angle, only the side of the stripes comprising one of the pictures is seen. From an alternative angle, you see the side of the stripes comprising the other picture. If more than two images are divided and interleaved, it is possible to create multiple switching and simple animation effects – e.g., a butterfly flapping its wings.

The material supplied by TR is designed for dual switching – but this is not an absolute limit. However many switches are intended, the crucial thing is to align the image stripes so that each lies exactly under the lenses – i.e, in phase with the lenses. Most graphics software will enable you to create regularly spaced stripes, and something like Photoshop will enable two or more pictorial images to be sliced up and interleaved. The spacing between the lenses is 1.7mm – as measured between the crests.

3mm Acrylic Mirror Sheet

Like glass mirrors, this material is 'silvered' on the rear and provides a relatively tough substitute. It is supplied rough sawn in several sizes with the usable area stated.



3mm Mirror Acrylic		
Stock Code	Size	Price
231-102D	305mm x 305mm	£4.50
231-102C	610mm x 305mm	£9.00
231-102B	610mm x 610mm	£18.00
231-102A	1220mm x 610mm	£35.00

<http://www.mutr.co.uk>



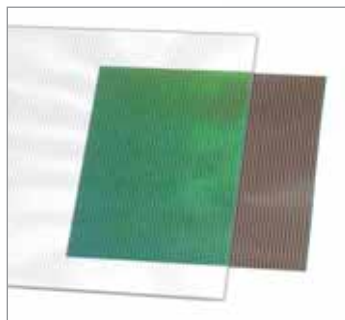
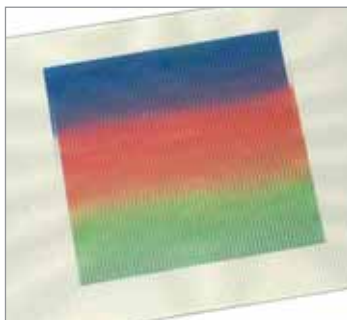
The Teaching Resources website has a vast selection of products for all types of projects and classroom experiments. Categorized into different product sections, items can easily be found, or you can perform a simple site search. Secure online ordering and special low prices for schools.

Petrobond Casting Sand

This is the original oil-bonded casting sand now available in smaller quantities. Because the sand has almost perfect adhesion qualities, it is used for high-precision mould making. Also, unlike cheaper sand made up using water, it poses no risk of explosion when suddenly exposed to hot metal. Petrobond can easily be used on a small scale for casting anything from pewter to aluminium.



1Kg Petrobond casting sand – Stock code 234-110 – £2.25



Positioning the image stripes are slightly out of phase with the lenses can give rise to spectacular optical effects – especially when the printed graphics are moved under the lenses. This phenomenon offers endless unexplored graphic design opportunities.

Three sample printed images are provided with each purchase of the animation plastic – i.e.,

1. Parallel black lines – giving a white/black/white switch
2. Red and green interleaved stripes – giving a red/green switch
3. Red and green interleaved stripes out of phase with the lenses – giving rises to optical 'pyrotechnics' when the sheet is moved at different angles under the sheet.

Animation plastic sheet (150mm x 150mm x 3.5mm)
Stock code 234-111A – £2.00



The current catalogue contains some great extracts and ideas for projects from previous News and Views articles as well as a wealth of supporting information on individual items. If you have not received yours please contact:

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