

Light fastness testing: helping us to show our true colours

Dr Carol Graham, Technical Manager of James H Heal & Co, explores the issues surrounding this essential technology. Of all the types of colour fastness testing, gauging a material's reaction to light is probably one of the most important. How fabrics perform during washing, dry-cleaning, rubbing, perspiration etc. or following exposure to different kinds of water is of course vital information for manufacturers. But the effects of light can be far more subtle and unpredictable, so it's here that accurate, reliable testing is crucial.

Anticipating light fastness correctly can be a question of make or break for some businesses. A new product whose colour starts to change too quickly could damage a company's reputation for years. Imagine a swimsuit that fades in the sunshine or motor car upholstery that fades where the light catches it. Without thorough, efficient testing, these scenarios would be all too common.

Light fastness testing gives manufacturers confidence in their products. It helps them extend ranges, enter new markets and develop innovative materials ahead of their competitors. It also enables them to meet national, international and retailers' standards. And it means they can experiment with a range of new products – and know they've got them right before launching them, rather than just crossing their fingers.

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THE BEST WAY TO TEST

So for many industries, light fastness testing is a fundamental part of research and development and quality control. It's also one of the most difficult tests to get right. Exposing your samples to natural sunlight in the location where they're going to be used is impractical, as most materials this can take months or even years – and how many R & D departments can afford to wait that long? Instead, most manufacturers now use laboratory testers, which simulate natural light and speed up the testing process. The technology which does this most successfully is xenon long arc radiation. This is the only way to reproduce faithfully the sunlight spectrum, and it involves using different optical filters to replicate specific light conditions.

DON'T JUST LOOK AT THE LIGHT

It's not as simple as putting a material under a certain type of light and observing how it performs. Temperature and humidity must also be brought into the equation, because the stress they cause to many materials can have profound effects on their reaction to light. So light fastness testing instruments must also be able to control these environmental factors – to create the relevant conditions for each test and keep them consistent throughout. And if the material is going to be used outdoors, the weather – particularly rain – is another important consideration. The testing instruments need a water spray that simulates rainfall, and that can be regulated to reflect the climate of different parts of the world.

MEASURE AND CONTROL

There needs to be a way of telling when the material has had enough exposure to light. For many years, 'blue wool light fastness reference standards' have been used to indicate the end of test exposure and for grading purposes. Now it's becoming more common for testers to measure and control the level of irradiance, the test being complete when a certain level of irradiance has been attained. The latter is obviously the more sophisticated technology: in the best systems, a sensor measures the light, and then automatically adjusts the lamp power to keep the light output constant. Both methods have their supporters, so the best testing equipment is that which lets you use both blue wools and irradiance control – individually and in combination.

WHO ACTUALLY DOES THE TESTING?

Until recently, most manufacturers wanting to run light fastness tests on their materials had to send everything out to specialist laboratories. It has been a complex and expensive process – something definitely best left to the experts. But now, technological advances have led to the development of modern, affordable

testing equipment, which is much easier to use. So it's viable for companies in a range of industries to do the testing themselves.

PERFECTING THE TECHNOLOGY

A recent example of this new equipment is an instrument called Apollo, which was developed by James H Heal & Co.



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With many years' experience in producing testers for all kinds of colour fastness, HEALS saw the emerging need for more accessible, user-friendly light fastness technology. (See pic)

Apollo has many technical advantages – a vertical xenon lamp, with sample holders, which rotate around it ensures consistent sample temperature and even exposure to the light source. The vertical rotating action also means realistic sample interaction with the humid air. The samples repeatedly pass through the same conditions, reducing test condition variations and producing much repeatable results. (See pic).

The ability to accurately control temperature and humidity is important. Testing equipment needs a way of anticipating the effects

they can have on each other. Apollo has an expert 'fuzzy logic' control system, which overcomes these uncertainties, to achieve the desired settings without one factor throwing the other out of balance.

Apollo's irradiances control sensor, SolarSens, rotates in exactly the same way as the samples under test. This means it measures the same light as the sample sees, giving the most accurate control. Uniquely, SolarSens measures three different wavelengths of light, enabling Apollo to comply with a wide range of testing standards.



MAKING TESTING MORE ACCESSIBLE

Probably the biggest advantage of the latest light fastness testers is that they're easy to use and look after. With Apollo, for example, simple controls and a menu-driven interface mean operators require only minimal training.

And the ergonomic design allows most maintenance to be done from the front of the machine. Lamps and optical air filters are very easy to replace, so not only is this equipment more affordable to acquire, it's also cheaper to keep.

So light fastness testing is essential for many types of products – from clothing to car seats, tents to tarpaulins.

And, although it's a complicated process, it's becoming less of a specialist technology. New, easy-to-manage equipment has brought it within the reach of many manufacturers, who no longer have to rely on external testing laboratories. They can carry out the tests themselves whenever they want. Leaving no excuse for a fading swimsuit... One of these units is currently being supplied to a customer in South Africa. ■

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Apollo Light & Weather Tester



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- > Specimens and **SolarSens** rotate around the lamp
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- > Weathering facility included
- > Low running costs

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