ASK THE EXPERT: REPELLENCY AND WATERPROOFING

Our series featuring question-and-answer sessions with recognised industry experts on specific topics continues. One change for 2012 is that our expert for each subject will come from an academic rather than commercial background. In this first issue of the year, **Dr Peter Hauser** of the Textile Engineering, Chemistry & Science Department at North Carolina State University answers questions about repellency and waterproofing.

Rain dance

Dr Peter Hauser is a professor in textile engineering, chemistry, and science at the College of Textiles at North Carolina State University in Raleigh. His research interests include chemical finishes for high performance textiles and repellent, soil release, and flame retardant finishes. Having been a student at the same college, Dr Hauser then spent 24 years in industry, in textile manufacturing and textile chemical companies. He holds ten US patents in the areas of soil release, flame retardancy, and low-pollution dyeing. He has travelled extensively in the US, Latin America, and China providing technical assistance to textile manufacturers. In 1997, Dr Hauser joined the faculty of the College of Textiles. He has published extensively in the field of textile chemistry literature.

Question: What are the main differences between water-repellent finishes based on hydrocarbon chemistry and those based on fluorocarbon chemistry?

Answer: Fluorochemicals provide the lowest surface energy of any chemical finish. Repellency depends on both surface energy and fabric construction, so the lowest surface energy finish gives the best repellency on a given fabric. Unfortunately, this improved repellency comes at a much higher cost. It is prudent to choose the chemical finish that matches the customer's performance specifications.

Europe's Ryder Cup golfers were kept dry in the torrential rain at Celtic Manor thanks to Scottish outerwear brand ProQuip.

ProQuip



Dr Peter Hauser of the Textile Engineering, Chemistry & Science Department at North Carolina State University.

North Carolina State University

Q: What is the reason for manufacturers producing fabrics with a water repellency factor that is so far beyond any conditions the wearer might experience? Some would appear to be sufficient for deep sea diving.

A: Construction engineers design bridges with built-in safety factors to guarantee that the structure will withstand any conceivable condition that might jeopardise its integrity. Having a seemingly extreme repellency is a way of guaranteeing performance at lesser levels, such as most wearers will experience.

Q: As far as you can tell, what impact has the implementation of the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) directive on chemicals in the European Union had on this market in terms of processes, ingredients or research and development?

A: According to manufacturers of repellent finishes, commercial finishes have been pre-registered with REACH and will undergo the required testing if deemed necessary. The majority of finishes based on perfluorooctal (C8) chemistry have been replaced with perfluorohexyl (C6) chemistry due to concerns with perfluoro-octanoic acid (PFOA). In many cases, the overall repellency performance has suffered when C6 chemistry has replaced C8 chemistry.

Q: What progress is being made in products that have traditionally been difficult to waterproof such as fleece, some soft shell fabrics, and down?

A: Cotton Incorporated, based in Cary, North Carolina, has developed a process called 'Storm Cotton' that provides excellent repellency to these type of fabrics.

Q: In time, will silicone-based finishes become viable alternatives to fluorocarbon-based DWR finishes? The context here is that we believe silicone is good at repelling water but not at seam sealing, which is why silicone is more frequently found on softshell type garments. It would be good to know if you are seeing any developments in this area.

A: Unless some special process (lotus-effect finishes, for example) is developed, silicone finishes will not be able to approach the performance of fluorochemical finishes since the surface energy of silicone finishes is higher than the surface energy of fluorochemical finishes.

Q: When it comes to tests for the repellency of fabrics for sports and outdoor garments, which are the methods that you think brands and garment manufacturers should pay most attention to and why?

A: I believe that test methods that simulate an actual rain condition are the most appropriate for sports and outdoor garments. Examples include American Association of Textile Chemists and Colorists (AATCC) test methods 35 and 42. Test method 35 measures the resistance of fabrics to the penetration of water by impact and can be used to predict the probable rain penetration resistance of fabrics. A test specimen is sprayed with water for five minutes under controlled conditions. A blotter is weighed before and after to determine the amount of water that has leaked through the specimen during the test. Test method 42 measures the resistance of fabrics to the penetration of water by impact.

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