CHAPTER 27

Other Industrial Applications

According to an analysis carried out by the Freedonia Group [1] in 1994 the US market for coated textiles was 294 Mio/m². This had a value of $2.5 billion. Most was textiles coated with PVC for use in the field of transport. The sector of protective working clothing was 10% of this quantity. This market segment had the biggest growth rate. In view of this, PVC will keep its dominant role in the market [1]. Polyester will increase further its share of the market as a textile substrate. The combination of PVC as a coating on polyester as a substrate is not expensive and fulfills all requirements.

Water vapor permeable materials are mostly used for functional textiles. Functional textiles (see Sects. 2.1, 26.1, and Chap. 18) are designed products adapted to the demands of their users and the required physical property. Examples are clothing for soldiers, protective clothing for workers in chemical companies or in plants working with hot metals or sharp-edged metals. Important requirements are flame resistance, resistance to chemicals, such as alkaline products, amines, solvents, carbohydrates, acids, etc. Further important physical properties are flexibility, abrasion resistance, bactericidal [89] or anti-static properties, easy to process into the finished article, washability and/or dry-cleanability and comfortable to wear [88].

Polyurethane-coated textiles are mostly used in the production of shoes and clothing [49]. The water vapor permeability is for all articles worn near the body a most important property (Chaps. 1 and 4). Bags (11 [13]) do not need water vapor permeability just as much but is nice to have this property. Here fashion-orientated effects, the grain pattern, touch, color, glossy or mat effects, besides abrasion resistance, and flexibility are regarded as being important.

Synthetic materials can be used in the normal production of shoes using similar production techniques to those used with genuine leather (1 [2], vol. 11). In fashion clothing almost no leather substitute has lasted for a long time apart from synthetic suede types (Alcantara®) or shoe uppers and gloves for (golf) sport. Materials showing a reasonable wear performance when used together with a lining have gained good market success in sportswear. They can be processed, e.g. by a hot melt adhesion of a microporous PUR membrane with a textile [13].

Functional Clothing. Clothing containing microporous materials are able to transport water vapor, created by perspiration of the wearer, out. Water should not be able to condense in the interior of such clothing even at external low tem-
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Peratures [4]. Abrasion-resistant, water vapor permeable protective clothing may be produced from Aramid® fabric with a coagulated polyurethane containing quartzite [16]. Protective clothing for workers which can be worn near flammable liquids and are able to prevent electrostatic charges on its surface can be produced with leather substitutes (23.2 [9]).

Materials for clothing for people working in hospitals, especially in rooms where surgical operations are performed, besides being water vapor permeable should also be easy to bond together and resistant to electrostatic charges on the surface. However these kind of properties still have to be achieved [79]. Knitted polyester fabrics become microporous by a high temperature sealing process. Clothing with good wearing properties can be produced out of these fabrics [63].

Layers of a coagulated polymer containing active carbon and silicic acid on cotton, polyamide or polyester fabric can be used in the production of combat clothing because they protect against chemical weapons like gas or nuclear fallout. The same material can be used for packing weapons, ammunition, food and pharmaceuticals or to seal things against chemical weapons and nuclear fallout [41]. Good theroinsulation as well as a high water vapor permeability is important for sleeping bags ([31], 16 [16]).

Protective gloves for industrial and military use are produced out of cotton fabrics with microporous layers on top of them. Another microporous layer is then applied which is a selective membrane consisting of cellulose, polyamide, polyurethane, etc., on top of the first microporous layer [9].

Sports articles are an increasing sector of water vapor permeable products; i.e. apparel, shoes, bags, gloves, bands for tennis rackets, grips etc. Membranes applied onto knitted or woven textiles or nonwovens which have elastic fibers are often considered suitable for outdoor sportswear (Fig. 27-1) (see also Chaps. 16 and 18.2 and [85]).

As previously mentioned (Chap. 18) one main use of water vapor permeable products is as a liner (Fig. 27-2; 3 [1]). Liners protect against wind and are water vapor permeable. The outside fabric protects the microporous layer inside against abrasion or the hydrophilic layer against the action of liquid water.

Materials used for making tents are based on water impermeable but water vapor permeable materials (29.1 [16], [6,7]).

Until now microporous and hydrophilic products were mainly used in the manufacture of shoes and clothing.

In a general sense, these kind of materials are membranes – allowing defined products to permeate a frontier between an inside and an outside part of a

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**Fig. 27-1. Sectors for water vapor permeable products (18.2 [2])**