

Migration Fastness

In recent months the PFI physics laboratory has had to investigate several cases of complaints arising from inadequate migration fastness of leather and also of synthetic and textile upper materials.

In materials science the term “migration” refers to the proclivity of substances to move from one material to another. The generally undesired consequences frequently give rise to complaints. In the cases most recently investigated at PFI, the substances which migrated were dyes, but other substances such as plasticisers or fattening agents can also migrate. In the footwear industry the phenomenon has become apparent through cases of dyes migrating from open-pore leathers such as suede and nubuck leathers into light-coloured outsole materials – primarily PVC and TR soles – leading to discolouration.

The Bleeding Colour Hue Is not Necessarily that of the Responsible Material

Curiously enough, in cases of dye migration it is not uncommon to observe that the bleeding colour hue bears no resemblance to the original hue of the leather. The reason for this phenomenon is that actual colourings usually consist of a mixture of dyes. If just one of the dyes is not fast to migration then it can cause discolouration. This explains why, for example, a black leather can colour another material green or red, or a green leather can be responsible for a brown discolouration. The intensity of discolouration depends upon the concentration of the dye in the material.

Such discolourations are observed most frequently in footwear made of suede or nubuck leather. These leathers are mostly through-dyed, which requires a considerably greater quantity of dye than surface colouring. It may happen that a substantial proportion of the dye used is not bound to the leather fibres and thus constitutes a greater risk of migration. Yet textile or synthetic materials can also cause discolouration, wherever the dyes are inadequately fixed or not migration fast.

Conventional Laboratory Test Method

The migration behaviour of leather colouring agents is investigated in the laboratory according to DIN EN ISO 15701. Textiles and synthetic footwear materials are also tested by the same method in order to ensure comparability of the results.

In this test method the side of the sample to be examined (such as upper material) is placed in contact with a standardised PVC material described in the official standard, or the with materials used in making a shoe, under a defined pressure for 16 hours at $50\text{ °C} \pm 2\text{ °C}$. After a set cooling period, bleeding of the contact materials is assessed by comparison with the grey scale. This is accomplished by comparison of the contrast values between that part of the contact material (PVC, sole) which was in contact with the leather or the upper material and a part of the same contact material which did not come into contact with the leather/upper material.

In order to reduce the likelihood of complaints, dyes and materials should be tested for migration fastness. In this context, it must be pointed out that migration fastness of a colour does not also constitute [fastness to perspiration or bleeding under the influence of moisture](#)..

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The images visualise the effect of migrating dyestuff on PVC material:

