

## A Cautionary Note

# Rapid Test for Chromium(VI): How Reliable?

***A Danish research group has developed a fast screening procedure for the contact allergen chromium(VI) in leather and metal alloys. Is this test a reliable method for detection of chromium(VI) contamination in leather without any need for sophisticated laboratory testing?***

Chromium(VI) is a known contact allergen which may be present in leather and is often cited in association with health problems encountered on wearing leather articles. Annex XVII of the REACH Regulation sets a limit of 3 mg/kg of chromium(VI) in leather. The standard DIN EN ISO 17075 provides a test for compliance with this limit. On reaction with diphenylcarbazide (DPC) chromium(VI) forms a pink complex which can be quantified photometrically.

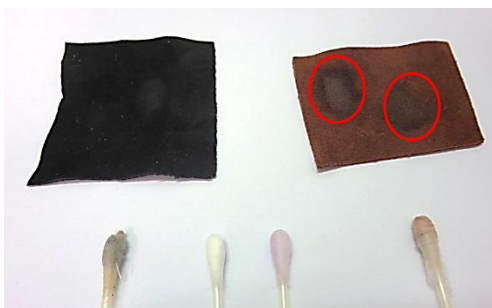
A Danish research group recently published a study on the development of a rapid test for chromium(VI) in consumer goods made of metal or leather and in jewellery. The article appeared in the journal COD (Contact Dermatitis, Vol 73, Issue 5, pp. 281–288, Nov 2015; also available online). This rapid test for chromium(VI) is likewise based on the reaction of chromium(VI) compounds with DPC. The test is reported to rapidly identify any leather article, metal, or jewellery contaminated with chromium(VI) in order that patients shown by a patch test to be sensitive to chromium(VI) can react appropriately and avoid direct contact with these articles. Such a rapid test for chromium(VI) would clearly be desirable as a very useful tool in the leather industry and the leather trade for fast and straightforward recognition and rejection of leathers contaminated with chromium(VI). But just how reliable is this rapid test?

Several years ago PFI attempted to develop and establish a rapid test for chromium(VI) on the basis of numerous laboratory tests. However, experience gained in this work led us to advise against such a rapid test for chromium(VI). Reservations about the use of a rapid test for chromium(VI) were many and are also shared in part by the Danish research group:

- The reagents are in part strongly corrosive or highly flammable and can only be safely produced and used by expert personnel.
- The DPC reagent rapidly decomposes on storage at room temperature and thus loses its effectiveness, possibly leading to false negative results. According to the present publication, it remains stable for four hours at room temperature on exposure to light and for about two weeks on storage at 4 °C.
- The rubbing test is only performed on the surface of the leather. A non-uniform distribution of chromium(VI) in the various layers can lead to false positive or false negative results.
- In the case of finished and coated leathers, the reagent may not penetrate into the leather matrix and false negatives may result.
- Coloured leathers may give false positive or false negative results because they may mask the colour change to pink by the appearance of a red, violet, brown or black colouration, or simulate the appearance of a pink colour through the presence of pigment particles.
- Leather articles may be damaged, and thus rendered unusable, by the highly acidic reagent at the spot where the rapid chromium(VI) test is performed.

Regular laboratory chromium(VI) determination according to DIN EN ISO 17075 requires well-trained personnel and maximum care in execution to avoid false positive or false negative results. Use of the rapid test is unsuitable for assessment of chromium(VI) contamination in leather because of the above-mentioned possible sources of error. In our view, reliable information about the chromium(VI) content of leather products can only be provided by laboratory tests performed under controlled conditions.

Examples of the rapid tests performed:

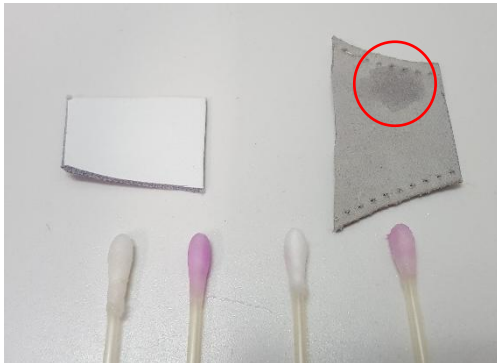


**Fig. 1:**

**Left:** Loss of colour from black leather;

**Below, centre:** Two comparison cotton swabs (unused and chromium(VI) 3 mg/kg);

**Right:** Loss of colour from brown leather; red circles: discolouration / alteration of the leather after the test

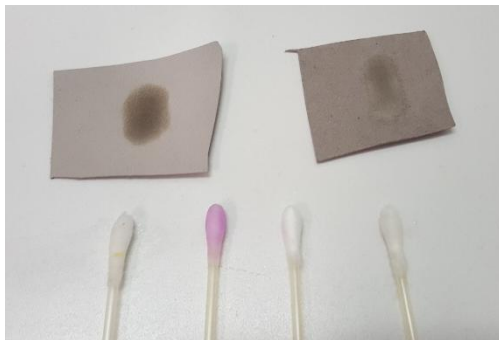


**Fig. 2:**

**Left:** Leather front side (finished), test negative;

**Below, centre:** Two comparison cotton swabs (chromium(VI) 3 mg/kg and unused);

**Right:** Leather reverse side, test slightly positive (result according to ISO 17075: 11 mg/kg)



**Fig. 3:**

**Left:** Leather front side (finished), test negative, slight loss of colour (result according to ISO 17075 3.4 mg/kg);

**Below, centre:** Two comparison cotton swabs (chromium(VI) 3 mg/kg and unused);

**Right:** Leather reverse side; test negative

**Further information:**

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