

Specification

TK11 Chromium-6 Detection Test Kit

for surface contamination, dust particles, coatings and paint layers

v9

Introduction

The MATinspired TK11 Chromium-6 Detection Test Kit is used for the detection of chromium-6 in surface contamination, dust particles, paint layers, coatings or other materials.



Sensitivity of the chromium-6 test

The sensitivity of the chromium-6 test has been tested with different amounts of chromium-6 (see Figure 1). There is a clear gradation in colour when the amounts of chromium-6 vary from high to low levels. As expected, the colour is purple when there is chromium-6 present. If less than $\sim 0.2 \mu\text{g}$ of chromium-6 dissolves from the coating or paint layer, no apparent purple colour is visible (below the detection limit). Paint layers containing chromium-6 generally contain much more chromium-6 than the detection limit, and will therefore be detected with this chromium-6 test.

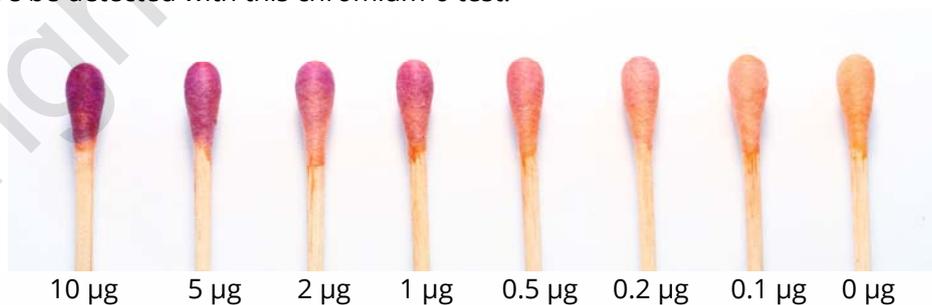


Figure 1. Results of the chromium-6 test at different amounts of chromium-6.

Reactions with materials containing chromium-6

All tests with materials containing chromium-6 show a clear purple colouring (see Table 1). The purple colour of each swab is gone after a few hours.

Table 1. Reactions of swabs with materials containing chromium-6

Material to be tested	Colour of swab
Calcium chromate (CaCrO_4) powder	purple
Chromium-6 conversion coating on zinc layer	purple
A drop of chromium(VI) oxide (CrO_3) solution in water which contains a total of 1 μg of chromium-6	purple
Lead(II) chromate (PbCrO_4) powder	purple
Lead(II) chromate primer (10% PbCrO_4)	purple
Sodium dichromate dihydrate ($\text{Na}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$)	purple
Strontium chromate (SrCrO_4) powder	purple
Zinc chromate (ZnCrO_4) powder	purple
Zinc chromate primer on aluminium	purple
Zinc chromate primer on steel	purple
Zinc chromate primer and coating on aluminium, cut with a Stanley knife	purple
Zinc chromate primer and coating on steel, cut with a Stanley knife	purple

Reactions with materials not containing chromium-6

In order to determine possible cross-reactions of the swabs from the Chromium-6 Detection Test Kit with other materials, we tested the swabs together with various materials that do not contain chromium-6 (see Table 2). If the swabs remain orange, then you know that there is no chromium-6 present in your material. If your swab turns purple, this is most likely caused by the presence of chromium-6.

Table 2. Reactions with materials not containing chromium-6

Material to be tested	Concentration/quantity	Colour of swab
Aluminium	100% aluminium	orange
Cadmium	100% cadmium	orange
Chromium(III) oxide (Cr ₂ O ₃)	24 µg chromium-3	orange/green (from chrome-3)
Structural steel S235JR	–	orange
Copper	100% copper	orange
Lead	100% lead	orange
Manganese	100% manganese	orange
Brass	–	orange
Nickel	100% nickel	orange
A drop of sodium molybdate solution in water	≥200 µg molybdenum-6	dark purple *)
A drop of sodium molybdate solution in water	<100 µg molybdenum-6	orange
Stainless steel 304 and 316	–	orange
Rust (Fe ₂ O ₃) on metal	–	orange / brown (from rust)
Tin	100% tin	orange
Vanadium	100% vanadium	orange
Paint layer without chromium-6	–	orange
Tungsten	100% tungsten	orange
Iron	100% iron	orange
Zinc	100% zinc	orange

*) This cross-reaction occurs only at high concentrations of molybdenum-6. The test rods are therefore much more sensitive to chromium-6 than to molybdenum-6. The colouring caused by molybdenum-6 is dark purple in the beginning and will change to dark blue after about three hours. The latter colouring is permanent. Such a permanent colouring does not occur with chromium-6, and therefore a permanent dark blue colour can be used to recognise the cross-reaction with molybdenum-6. Molybdenum-6 is rarely used in coatings, and therefore this cross-reaction will occur very rarely in practice.

Temperature dependence

The Chromium-6 Detection Test Kit has been tested at ambient temperatures between 4°C and 50°C. Both the test surface and the test kit (including swabs and test fluid) were set to the appropriate temperature. The test results (the degree of purple colouring of the swab) are independent of the ambient temperature. The test kit can therefore be used between 4 °C and 50 °C.

Reproducibility

The reproducibility of the Chromium-6 Detection Test Kit has been tested with the same amount (0.5 µg) chromium-6 (see Figure 2); Each swab – from various batches – gives a similar result under the same laboratory conditions (similar degree of purple colouring of the swab). De test is therefore reproducible.



Figure 2. Reproducibility of the chromium-6 test at 0,5 µg chromium-6.

Note: All percentages in this specification are expressed as a percentage by weight.