False-positive result when a diphenylcarbazide spot test is used on trivalent chromium-passivated zinc surfaces - DTU Orbit (01/07/2018)

A colorimetric 1,5-diphenylcarbazide (DPC)-based spot test can be used to identify hexavalent chromium on various metallic and leather surfaces. DPC testing on trivalent chromium-passivated zinc surfaces has unexpectedly given positive results in some cases, apparently indicating the presence of hexavalent chromium; however, the presence of hexavalent chromium has never been confirmed with more sensitive and accurate test methods.

Objectives
To examine the presence of hexavalent chromium on trivalent chromium-passivated zinc surfaces with a DPC-based spot test.

Methods
A colorimetric DPC spot test was used for the initial detection of hexavalent chromium on new and 1-year-aged trivalent chromium-passivated zinc surfaces. Then, X-ray photoelectron spectroscopy (XPS) was performed for all samples.

Results
The DPC spot test indicated the presence of hexavalent chromium in aged, but not new, trivalent chromium passivation on zinc; however, subsequent analysis by XPS could not confirm the presence of chromium in a hexavalent state.

Conclusions
Unintended oxidation of DPC induced by atmospheric corrosion is suggested as a possible reason for the false-positive reaction of the DPC test on a trivalent chromium-passivated zinc surface. Further validation of the use of the DPC test for chromium-containing metallic surfaces is required.