# Measurement of Cr/Ni/Cu coatings on plastic substrates

**Bathroom fittings are commonly finished with a decorative chromium plating. But what may appear to be a solid metal shower head, for example, is often just a multi-layered metal coating on top of a plastic substrate. To guarantee that the shower head not only look pretty when delivered but even after many years of usage, the thickness of each individual layer must be controlled to ensure quality.**

The typical composition of such shower heads is a chrome/nickel/copper coating system on top of a plastic substrate material. The decorative chromium outer finish is usually only 0.5µm thick (or less) and the nickel layer about 5-10µm. If the copper layer is between 20-25µm, making the overall coating thickness no more than 30µm, non-destructive measurement using the x-ray fluorescence (XRF) method is possible.



Fig. 1: Shower head with Cr/Ni/Cu coating on plastic substrate

For this kind of application, x-ray fluorescence instruments with a proportional counter tube are perfectly suited. Even with small measurement spots, sufficiently high count rates can be obtained due to the large detector area, ensuring good repeatability precision. Because of the large, easily accessible measurement chamber, the robust instruments of the FISCHERSCOPE® X-RAY XDL® family are well suited for large specimens with complex shapes.

To maximise the precision of the results, proper positioning of the object is essential, for example by choosing an intrinsically horizontal area or correctly aligning the sample. To assist in this crucial step, FISCHERSCOPE® X-RAY measurement systems are equipped with a laser pointer as positioning aid and high-magnification camera optics. Using the video image generated by the WinFTM® software, the required exact focusing of the measurement spot can be achieved.

| Measurement spot | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Cr mean value | 0.17 | 0.17 | 0.17 | 0.17 | 0.16 |
| Standard deviation | 0.003 | 0.005 | 0.005 | 0.004 | 0.005 |
| Ni mean value | 7.24 | 7.40 | 7.10 | 7.29 | 7.21 |
| Standard deviation | 0.07 | 0.04 | 0.10 | 0.11 | 0.07 |
| Cu mean value | 21.40 | 21.90 | 22.10 | 20.10 | 20.60 |
| Standard deviation | 0.25 | 0.39 | 0.29 | 0.29 | 0.26 |

Table 1: Typical results of an x-ray measurement, collected using a FISCHERSCOPE® X-RAY XDLM® with a measuring time of 30 seconds for four measurement cycles per spot

**For determining the thickness of decorative Cr/Ni/Cu platings on plastic substrates with a maximum overall coating thickness of approximately 30µm, the cost-effective proportional counter tube measurement systems of the FISCHERSCOPE® X-RAY XDL® family are the optimal solution. To measure thicker coatings, instruments employing the (destructive) coulometric method are also available as an alternative. For more information please contact your local FISCHER representative.**

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Coating Thickness    Material Analysis    Microhardness    Material Testing