

## Using a XRF analyzer to compare original Tolix stools and copies

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### Overview:

The Tolix H-stool (<http://www.tolix.fr/en/products/1-seats/p/11-h-stools?detail=41>) is an iconic design that has been around for over 80 years. It is still manufactured in France by Tolix. Numerous copies of the design are made around the world, primarily in China. This study does a quick qualitative comparison between an authentic Tolix stools manufactured in France with a pair of readily available copies using X-Ray Fluorescence (XRF). A portable XRF is a recognized screening tool for looking for hazardous substances in consumer goods, including under the US CPSIA (Consumer Product Safety Improvement Act) and EU RoHS/WEEE (Reduction of Hazardous Substances / Waste Electrical and Electronic Equipment) initiatives. To give a rough idea of levels of concern for given elements, here are the regulatory compliance limits for these protocols.

Element	RoHS/WEEE	CPSIA
<b>Cd</b>	<100ppm	N/A
<b>Cr</b>	Cr <sup>6+</sup> < 1000ppm	N/A
<b>Hg</b>	<1000ppm	N/A
<b>Pb</b>	<1000ppm	<100ppm on substrate <90ppm surface
<b>Br</b>	PBB / PBDE < 1000ppm	N/A

Source: <http://www.olympus-ims.com/en/xrf-xrd/delta-handheld/delta-consumer/>

### Method:

The testing was done using a handheld XRF analyzer. The tests were for 60 seconds (30 seconds @ 40 kV for heavy metal analysis and 30 seconds @ 15 kV for light element analysis). The tests were done both on the painted surface and on sections where the powder coating had been scratched away to try to differentiate between signals coming from the powder coating and from the metal itself.

### Results:

The results are necessarily qualitative (heterogeneous sample, varying thicknesses), but did show some significant differences between the Tolix stool and the copies for both chemical risks and manufacturing quality.

#### - *Lead*

- The genuine Tolix stool did not show any significant (> 50 ppm) Lead (Pb) signal in the bare metal, coating or welds.
- One of the copies showed elevated Pb (>300 ppm) throughout the surface. The Pb signal was not present on the bare metal surfaces, implying that the

Lead was in the powder coating. Since the coating plus metal showed >300ppm, and the metal alone didn't show any lead, this implies that the Pb levels in the coating must be much higher than 300ppm. This matches previous Tolix laboratory testing on copies that showed Lead levels in the powder of 4.4% (44,000ppm) Pb.

- Both copies showed elevated Pb in the weld, which implies that they used a solder with high Pb content as well.

- ***Steel***

- The steel on the Tolix stool did not show any Zinc.
- The copies showed very high Zinc content in the steel. This implies they were using a lower grade of steel, which would be expected to be weaker than the genuine Tolix stool.
- The copies also showed elevated Mercury (>1000 ppm) in the steel. This may be due to a spectral overlap between Mercury and Zinc, or may legitimately be in the sample. It is a limitation of the method, and would recommend further lab testing to confirm this. It is worth noting that the Tolix stool does not show the potential of the Mercury in the sample and would not require any further testing to confirm.

- ***Welding***

- The Tolix weld material showed a high Copper content, which means they were using a copper-based solder.
- Both copies showed high Lead in the solder, and no Copper/Zinc content. Presumably they're using a Lead-based solder.
- The copper-based solder is probably stronger and definitely contains fewer hazardous materials.

**Overall, the genuine Tolix stool showed fewer hazardous materials (Lead and possibly Mercury) and used higher grade materials (low Zn steel, Copper-based solder). It demonstrates that there is a value to buying the genuine material and a cost to purchasing the less expensive knock-off.**

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