

Conforming to Legislation on Chromium Speciation in Toys

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Legislation is primarily implemented to protect the environment and the health of the consumer. Directives therefore often impose maximum allowable concentrations (MACs) of elements in specific matrices where higher concentrations are deemed to be a threat to the environment or the health of the population at large. With the recognition that physicochemical properties such as toxicity are strongly related to the chemical form of an element, the regulation of chemical species is becoming more commonplace. One of the most regulated species is hexavalent chromium. In European legislation alone it is regulated in automobiles, cement, workplace atmospheres, waste electrical equipment and packaging components.

Very recent legislation (European Toys Safety Directive (88/378/EEC)) is now imposing limits for hexavalent and trivalent chromium along with a number of elements and organic tin in children's toys. The limits are called migration limits and refer to the amount of element or elemental species that can migrate from the toy to the child when the toy is being used in an appropriate (not dangerous) fashion. The imposed levels for chromium species in the directive are shown in Table 1.

Species	mg/kg in dry, brittle, powder-like or pliable toy material	mg/kg in liquid or sticky toy material
Chromium (III)	37.5	9.4
Chromium (VI)	0.04	0.01

Table 1. Migration limits from toys or components of toys that shall not be exceeded

An extraction procedure was performed for a number of toy materials to establish whether the toy indeed contains any Cr species. Different 'extraction' approaches which then aim to mimic a 'migration' situation have been developed and applied. For the separation and determination of chromium species, an HPLC-ICP-CCT-MS method that had previously been tested for mineral waters was employed. The instrumental methodology was validated using a CRM and the extraction procedures were evaluated with species spike recoveries.