

Release of trace elements from porcelain enamelled table- and cookware

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CONCLUSION - Enamelled tableware mostly releases Li (3 – 800 ppb), Al (0.1 - 6 ppm), Co (0.2 – 800 ppb) and Ti (0 - 1ppm), with Co and Li exceeding the existing limits of the Resolution for Metals and Alloys (CM/Res(2013)9).

The current data can help decision makers setting limits when including enamelled contact material in the revision of Directive 84/500/EEC.

Relevant European legislation

- **Ceramics Directive 84/500/EEC:** Limits only for Cd, Pb; Test conditions: simulant 4% acetic acid, 22°C, 24h
- **Update of the Ceramics Directive:**
 - Limits for Cd and Pb will be lowered significantly
 - Limits for other elements will be included (DSV
 - Will test conditions remain the same? JRC study on bakeware & possible consecutive testing (limits vs third migration)
 - Vitreous enamelware might be included, although little data available
- **Resolution on Metals and Alloys (CoE CM/Res(2013)9):** Guidelines and limits for cookware made from metals and alloys. SRLs (Specific Release Limits) are based on tox data, intake data or ALARA principle

Currently, the European Commission is revising the Directive 84/500/EEC on ceramic food contact materials and plans to extend the scope with vitreous enameled articles and glassware. New release limits for Pb and Cd as well as limits for other metals are being discussed. However, little data exist on the metal release from vitreous enameled cookware. Vitreous enamelware consists of a metal substrate and an enamel coating (frit), which creates a very specific material. The substrate itself can be composed of several metals and alloys (aluminium, steel or cast iron) with possible contaminants and impurities; and more specifically oxides of Ni, Co and Li are important components of the frit.

Purpose

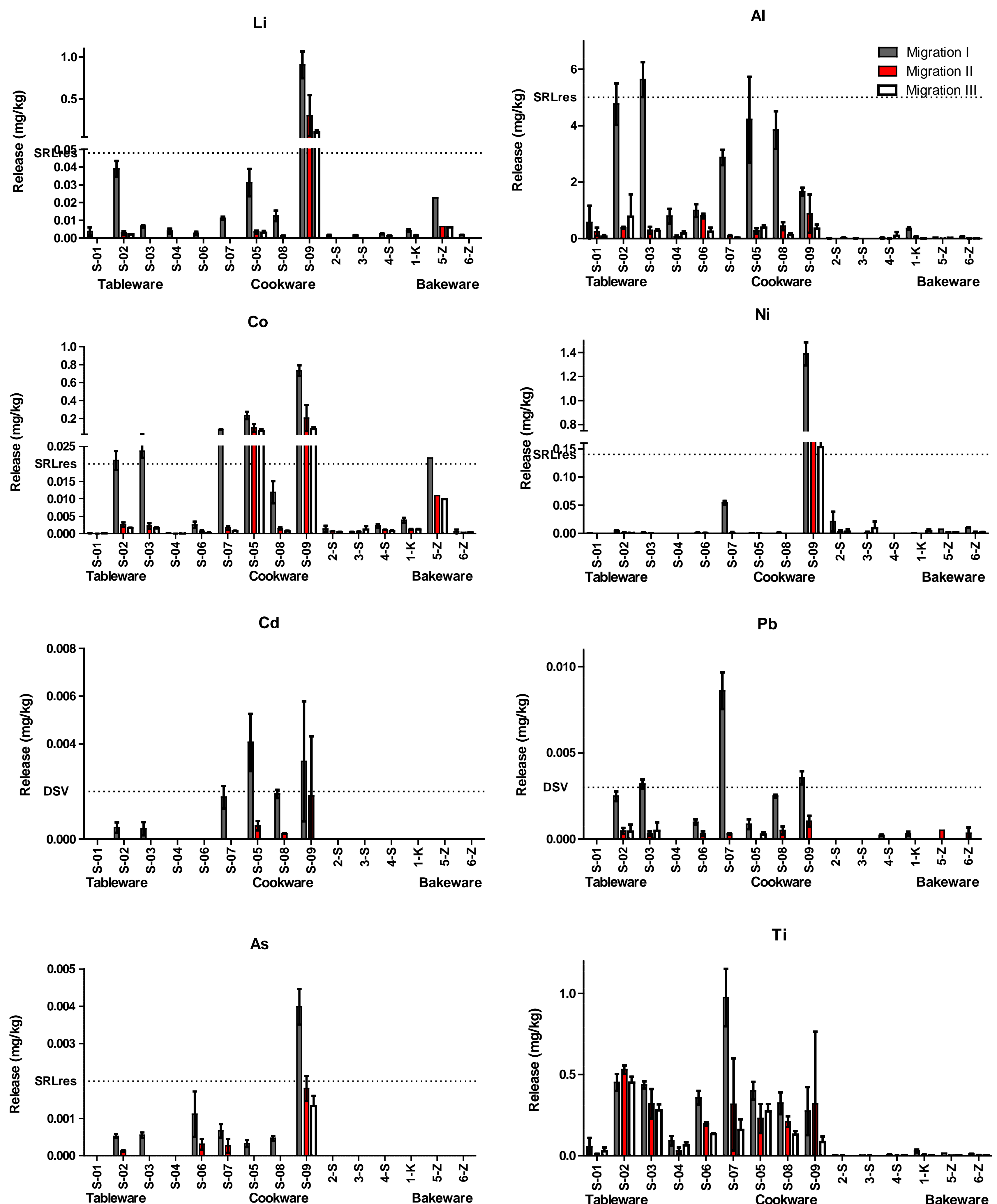
- Collect data as an answer to the call of the Europe who wants to set (new) limits for Pb, Cd and other metals (e.g. Al, Ag, B, Ba, Cd, Co, Cr, Cu, Li, Mn, Mo, Ni, Pb, Sb, Se, Ti, V, Zn) in the Directive 84/500/EEC since different elements can migrate from the enamelled material into food/water and might lead to health effects depending on the toxicity of the metal and released quantity.
- Which trends on metal release for enamelled tableware (focus on steel substrate) can be seen (compared to ceramics)?
- Compare the results with the SRLs from the resolution

Methods

- Testing of 15 enamelled samples on the European market (N=4): Steel as a substrate, both table-, cook- and bakeware.
- Test conditions: 4% acetic acid, 22°C, 24h (Ceramics Directive 84/500/EEC), 3 consecutive migrations with cleaning in between
- Measurement of trace elements in the simulant by ICP-MS: Li, Be, Al, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Mo, Cd, Sn, Sb, Ba, Ti, Pb, Ti

Results

- For Be, V, Fe, Zn, Se, Sn and Ti: very low or <LOQ release in all samples.
- For Cr, Cu and Sb elevated values for 2 samples, but still under SRLres.
- For Mo, Ba, Mn: elevated values for 1 sample, in the same order of magnitude as SRLres.
- For Li, Al, Co, Ni, As, Cd, Pb and Ti, 3 consecutive migrations are shown



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