

**TEAM  
STAINLESS**

# Safe Food Preparation Using Stainless Steel

Summary of a report prepared by the KTH Royal  
Institute of Technology on behalf of Team Stainless

# Executive summary



Stainless steel has played a key role in the production and preparation of food and drink for over 70 years. It is chemically inert and its constituent metals do not react with or transfer to food in any significant way.

Stainless steel is also non-toxic and can be manufactured into smooth, non-absorbent surfaces, equipment and utensils which can be safely cleaned, disinfected and sterilised without the risk of corrosion. It does not taint food and is highly resistant to the wide range and rapid changes of temperature frequently encountered in food production.

## The new protocol

In 2013, the Council of Europe (CoE) published a new guideline on metals and alloys in food contact materials, with prescribed limits for metal transference and a new, more aggressive test to simulate use in food preparation.

Team Stainless, a consortium of stainless steel and alloying element associations, commissioned the internationally renowned KTH Royal Institute of Technology in Sweden to independently test seven grades of stainless steel in accordance with the new protocol.

The study demonstrated that all the grades tested are safe to use for food preparation as the amounts of metals released were below the limits prescribed in the CoE guidelines. The study also demonstrated that the rate of metal release decreases significantly following initial exposure and with repeated use over time.

# The context of the study

Metals and alloys can be released by leaching under certain circumstances. For metal products in contact with food, such as pots and pans for example, it is important to ensure that the amounts released under all conditions are well below levels that would give cause for concern for human health.

Because stainless steel is an inert alloy it is inherently stable. Only vanishingly small amounts of metal are released in contact with foods, which is one of the main reasons why stainless steel has largely replaced other metals used in food preparation.

All of the evidence supports the conclusion that stainless steel is completely safe for all food and drink use.



# Regulation

In Europe, the Framework Regulation (EC) 1935/2004 specifically requires that “food contact materials are safe; and must not transfer their constituents to foods in quantities which could endanger human health, change food composition in an unacceptable way or deteriorate its taste and odour”.

The Council of Europe (CoE) published new guidelines regarding metals and alloys in food contact materials in 2013. These define Specific Release Limits (SRLs) for iron, chromium, nickel, manganese and molybdenum. The guidelines also include a new test protocol using a solution of citric acid as a food simulant, which is more aggressive to stainless steel than the acetic acid used in the previous tests.





## KTH study



The new guidelines presented an ideal opportunity for the industry to reconfirm the safety of using stainless steel in all types of food preparation. Team Stainless commissioned KTH to test seven grades of stainless steel in line with the new guidelines.

As well as some different procedures, these vary from earlier tests by using citric acid as the food stimulant, rather than acetic acid. Citric acid is widely used in a range of acidic and alkaline foods and is a more aggressive simulant.

The seven grades tested were selected from lower-alloyed grades up to high alloy materials to give a complete picture and included the two most common grades.

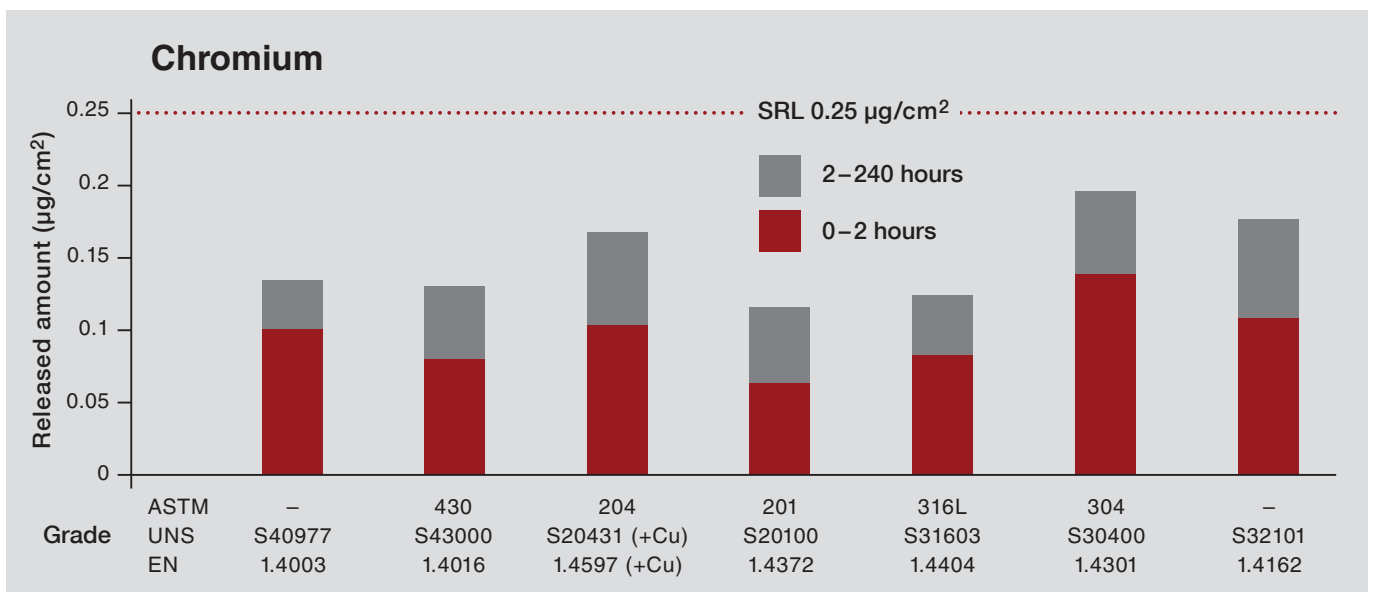
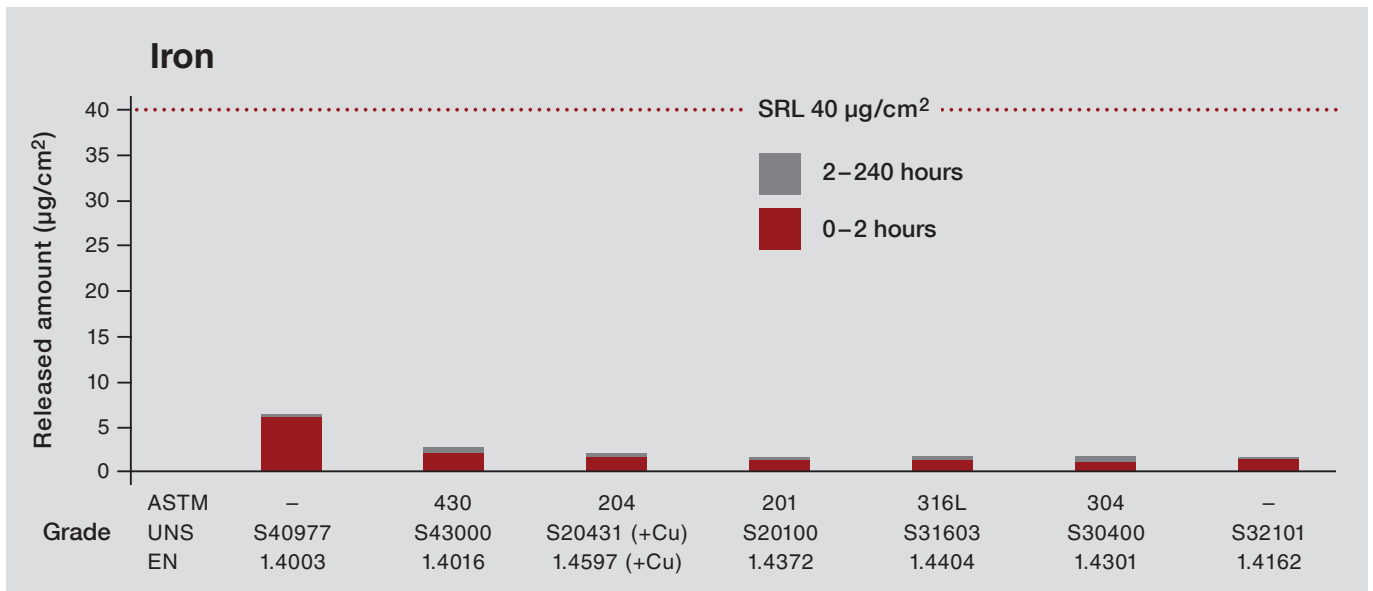
All samples were professionally prepared in laboratory conditions and tested with 5g/l citric acid (pH 2.4) for two hours at 70 °C, followed by two further periods of 24 hours and 238 hours at 40 °C.

Note: For simplicity the 24 hour results are omitted here, but they also passed the CoE test release limit requirements and they can be found in the full report.

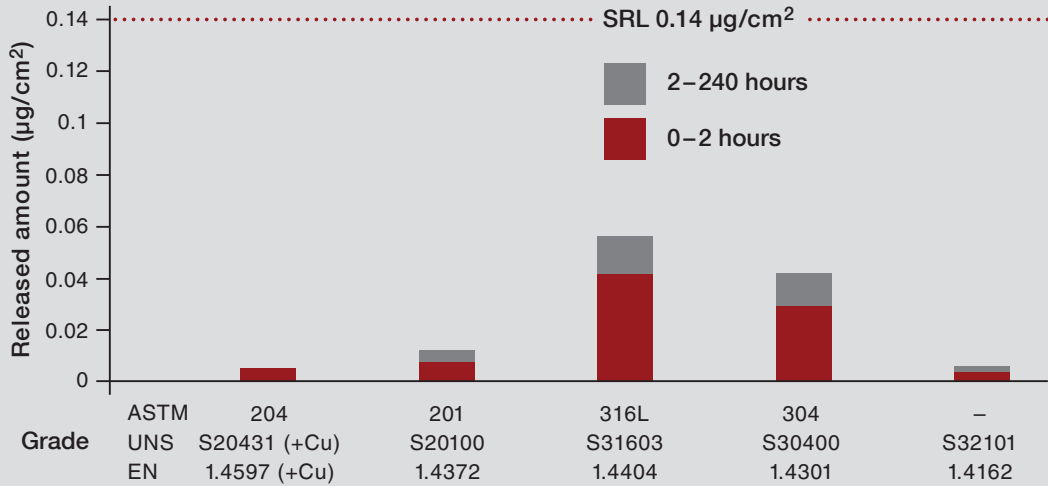
# Results of the study

For the relevant metallic elements of stainless steel, referred to below, all seven tested grades passed the test stipulated by the CoE guidelines. The study demonstrated that only small amounts of metals were released from all the grades tested, and that the levels were all below the Specific Release Limits (SRLs), for all exposure scenarios. This confirms that stainless steel is safe to use and acceptable as a food contact material.

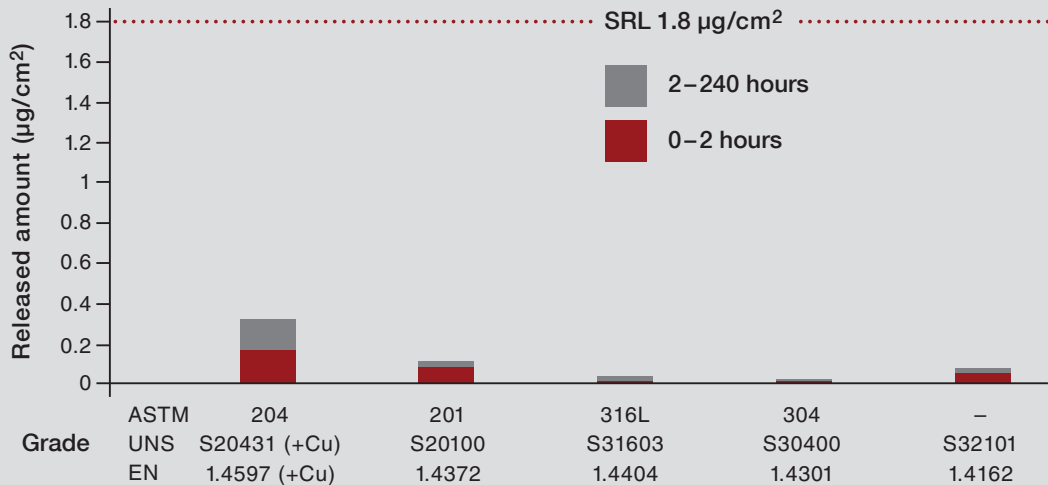
The diagrams below show the SRL for each metal at the top of the x-axis, and the grades tested along the y-axis. The bar for each grade shows the total amount released, showing the results after 2 hours and after 240 hours exposure.



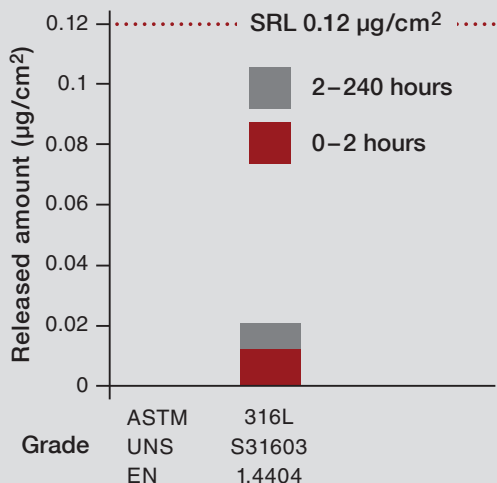
## Nickel



## Manganese



## Molybdenum



The study was able to demonstrate that the release rate of metals decreased significantly after initial exposure and with repeated use.

A more detailed technical summary of the report can be downloaded from <http://bit.ly/1USTJjn>. The full report is also available from <http://bit.ly/1Y8gAfd>.

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