CHROMATOGRAPHY

Think about **food**
Care about **safety**

Vol. 4

Acrylamide

ADIS INTERNATIONAL

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Focus on acrylamide in food

The global production and trading of food and feed products makes monitoring and control difficult.

Only analysis of food and raw materials for the production of food can ensure safe and edible food. Food safety is an essential part of our quality of life.

MN shows examples for food analysis that will help you with your work and make our food safer!

Vol. 4: **Acrylamide in ultra-heated starch-containing food**

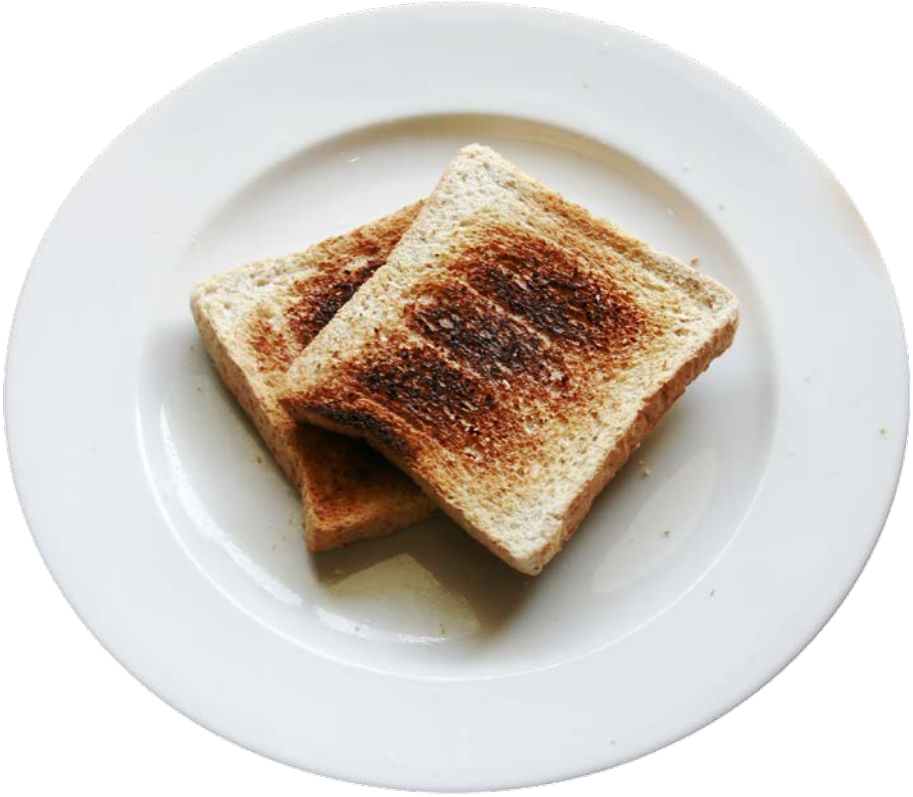
In 2002 Swedish researchers found acrylamide in potato chips, French fries and crisp bread [US National Library of Medicine National Institutes of Health http://www.ncbi.nlm.nih.gov/pubmed/14530144]. It is actually one component for plastics – a so called monomer.

Acrylamide is not added to the food, but it is formed from natural ingredients during heating. This reaction requires the presence of sugars (e.g, glucose, fructose), the amino acid asparagine and a relatively low water content. Acrolein (formed by thermal decomposition of fats) can also react with amino acids to form acrylamide in food.

The risk of acrylamide formation is especially high in foods that are fried, roasted, baked or grilled at high temperatures (120–150 °C) [European Food Safety Authority (EFSA) – http://www.efsa.europa.eu/en/topics/topic/acrylamide.htm].

Some examples of potentially contaminated food are listed below:

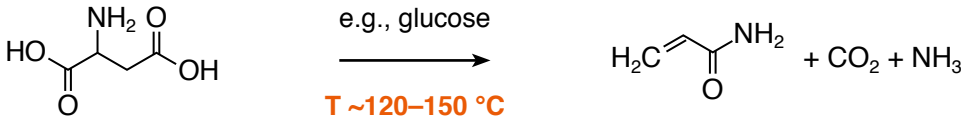
- Potato chips
- French fries
- Potato pancakes
- Fried potatoes
- Biscuits
- Toast
- Snack mixes
- Crackers
- Coffee, coffee extracts and coffee substitutes
- Breakfast cereals



Compounds of interest

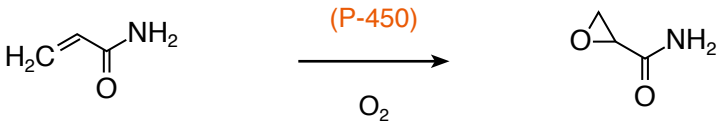
The chemical reaction that leads to the formation of acrylamide has not yet been entirely understood. However, the amino acid asparagine and reducing sugars such as glucose or other carbonyl compounds are involved.

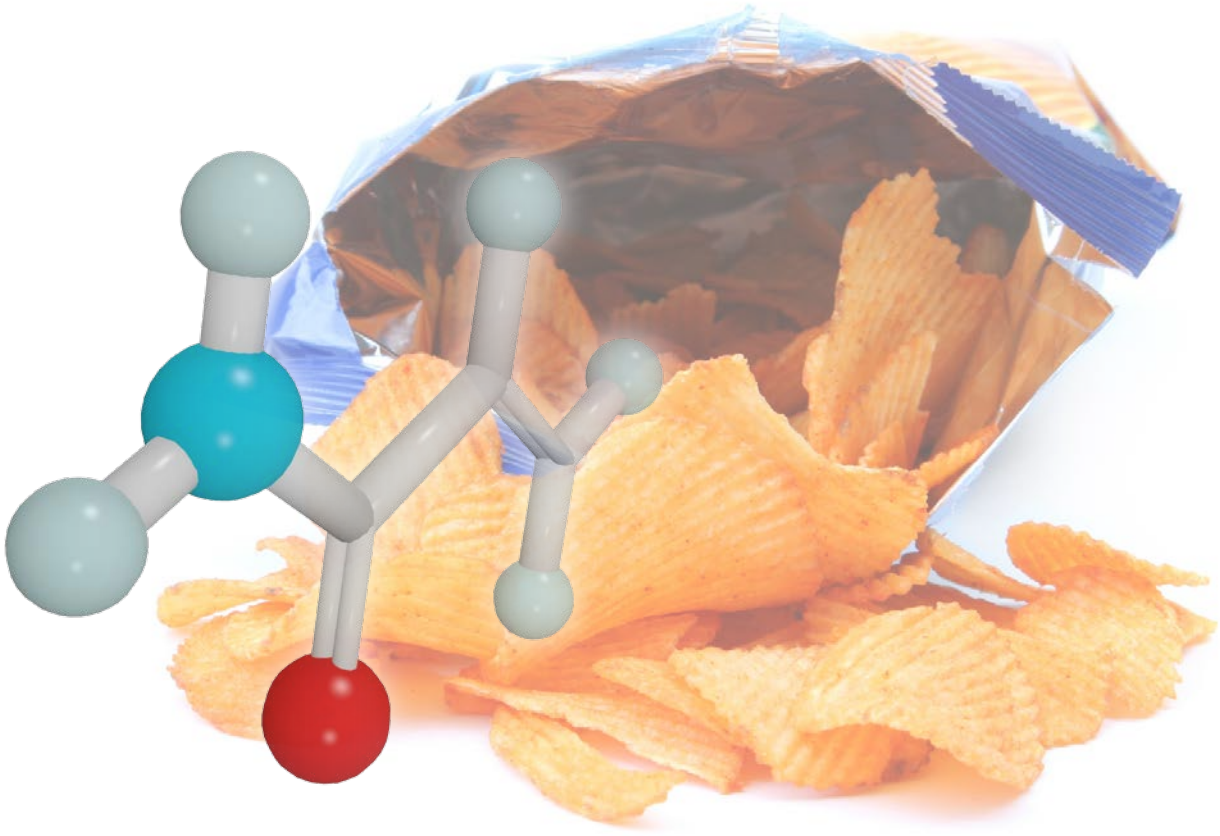
The following equations show the ways acrylamide can be formed in food.



Similar reactions also take place in the Maillard reactions.

In the liver acrylamide may be metabolized in the presence of oxidases and cytochrome P-450 to form an epoxide (glycidamide), which is strongly alkylating and suspected to be carcinogenic.





Typical samples, preparation

Acrylamide from coffee and coffee products acc. to E DIN 10785:2011-08

Sample pretreatment, preparation of the extract

2 g ground homogenized roasted coffee, instant coffee or coffee substitute or 5 g liquid coffee drink are weighed in a 50 mL centrifuge tube; 2 mL *n*-hexane are added and mixed briefly but vigorously; 100 µL of internal standard solution (D_3-acrylamide, c = 10 µg/mL) are added; after addition of 20 mL water the sample is again mixed briefly but vigorously and treated in an ultra sonic bath (40 °C, 15 min); if necessary, the sample is centrifuged (3000 g, 15 min)

10 mL of the aqueous phase (lower phase) is cleaned using the Carrez procedure:
1000 µL Carrez solution I, shake;
then 1000 µL Carrez solution II, shake;
centrifuge (2000 g, 4 min)

Residue is washed with 2–3 mL water and centrifuged again; the aqueous solutions are combined; the extract is cleaned by SPE.

Solid phase extraction (SPE)

MN Appl. No. 305571

Column type:
CHROMABOND® ABC18, 6 mL, 500 mg
REF 730533

Column conditioning:
5 mL methanol, then 5 mL water
(Do not let run the column dry.)

Sample aspiration:
The prepared sample is passed through the column into a vial using vacuum.

Washing:
2 x 2–3 mL water into the same vial

Drying:
with vacuum

Reconstitution: the combined eluate and washing water are transferred into a volumetric flask and filled up to 20 mL with water; for HPLC analysis an aliquot of the sample is transferred into the HPLC mobile phase.

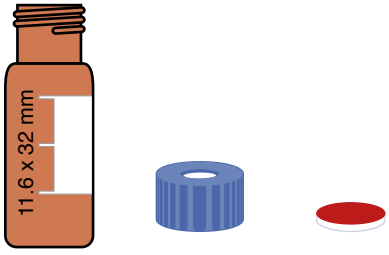
Recovery rate > 80 %

CHROMABOND® vacuum manifold for 12 columns

REF 730150

For other applications see *www.mn-net.com/apps*

Transfer into a sample vial, e.g., 1.5 mL screw neck vials N 9, amber, flat bottom, label and scale, wide opening,
REF 702284 and ready assembled screw closures N 9, blue, center hole with septum silicone / PTFE, REF 702287.1

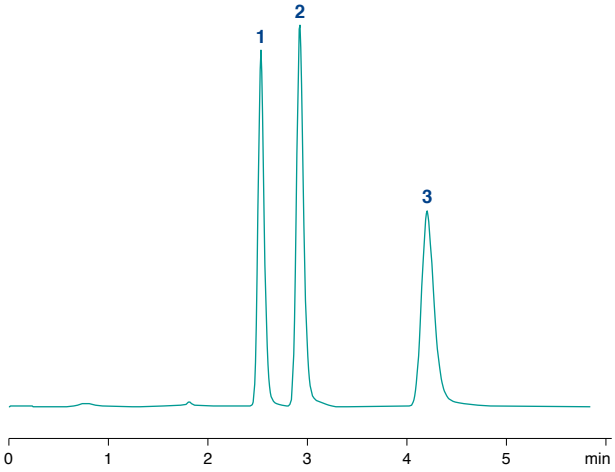


Subsequent analysis: HPLC

Separation of methacrylamide, acrylamide and methacrylic acid

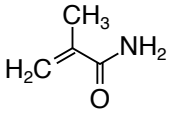
MN Appl. No. 123010

Column: EC 125/4 NUCLEODUR® HILIC, 5 µm
REF 7605551.40

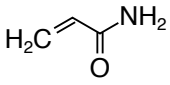


Peaks

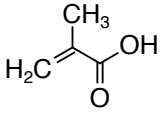
1. Methacrylamide



2. Acrylamide



3. Methacrylic acid



Detailed conditions are available online at *www.mn-net.com/apps*

It is recommended to filter the prepared sample through disposable filters **CHROMAFIL® Xtra PET-45/25**
REF 729220

Analysis

MN suggests using guard columns to protect your main column and significantly increase column life.

The **Column Protection System** (REF 718966) is suitable for all analytical HPLC columns with 1/16" fittings!

Product information

Ordering information

Step	Product	Pack of	REF
SPE	CHROMABOND® ABC18, 6 mL, 500 mg	30	730533
	CHROMABOND® vacuum manifold for 12 columns	1	730150
Filtration	Disposable filters CHROMAFIL® Xtra PET-45/25	100	729220
Vials and caps	1.5 mL screw neck vials N 9, amber, label and scale	100	702284
	Ready assembled screw closures N 9, blue, center hole with septum Silicone white / PTFE red	100	702287.1
HPLC 1			
Column	EC 125/4 NUCLEODUR® HILIC, 5 µm	1	760551.40
Guard column	EC 4/3 NUCLEODUR® HILIC, 5 µm	3	761962.30
Guard column holder	Column Protection System	1	718966

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