Sensory Evaluation of Food Contact Materials

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According to Art. 3 of the framework regulation for FCM (1935/2004) Food Contact Materials (FCM) like packaging and kitchen utensils should not transfer constituents to food in quantities that could induce a deterioration of the organoleptic characteristics thereof. Furthermore, GMP regulation 2023/2006 demands measures at any point of the production chain to fulfill this 'sensory inertness' for FCM.

Sources of Taints

base materials

- **plastics** — monomers, oligomers additives, processing aids NIAS
- **paper and board** — NIAS, additives
- **elastomers** — crosslinker, additives
- **printing inks, varnishes** — solvents binder resins low MW components / NIAS
- **adhesives** — solvents NIAS
- **wood, cork** — degradation of constituents surface treatment

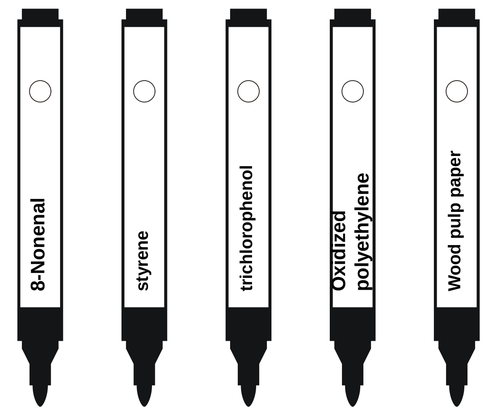
processing and storage

- **thermal processing** — extrusion, blow moulding, deep-drawing, heat sealing, thermal curing
- **microbial growth** — in/on the material (e.g. paper and board) external (storage environment)
- **high energy processing** — UV or γ-irradiation, electron beam
- **oxidative treatment** — ozonization H_2O_2 treatment corona treatment
- **external sources** — container palets storehouse
- **reaction with food components** — reaction of electrophiles with H_2S (protein rich food) yielding odor potent thiols

References for FCM related Taints

For identification of FCM related odors references have been provided amongst others by Nestlé[1] and TU Dresden[2], respectively. They can be classified as follows:

- **key odorants**
  single substances, that provide alone nearly the characteristic aroma of a normally complex mixture of odorous substances:
  8-nonenal for burnt PE plastic **(No. 1)**, styrene for odors from polystyrene **(No. 2)**
- **odor representatives**
  - single substances or defined mixtures, that are not necessarily olfactorial identical to the authentic taint alone, but can be used for a family of taints:
    e.g. trichlorophenol for ‚medicinal, disinfectant' **(No. 3)**
  - taints from thermal processing, generated from e.g. plastics by usage of a thermo-desorption oven at controlled temperature, time, oxygen concentration and gas flow: e.g. oxidized polyethylene **(No. 4)**
- **‚authentic taints'**
  aroma substances isolated directly from the material by solvent extraction, isolation by high vaccuum or steam distillation and concentration of the odorants by rectification
  e.g. wood pulp paper **(No. 5)**



Testing Conditions

For the evaluation of sensory compliance testing conditions (contact time/temperature, surface to volume ratio, irradiation) have been proposed in several standards (e.g. EN 1230[3], DIN 10955[4], ISO 13302[5], CRL guideline on testing conditions[6]). However, for some products like kitchen utensils these standards do not provide an unequivocal advice. That is why a **Working Group on the 'Sensory Evaluation of Consumer Products' of DGSens e.V. and EUROLAB-D** has been established with representatives of private labs, public surveillance, industry and academia.

The proposals for the sensory testing of various consumer goods have been developed based on experience and in-depth discussions of the participants and reflect the ***common practice*** in this field. To date (Oct 2016) twelve testing procedures have been released[7].

The working group is open for suggestions and proposals which can be submitted directly by email to: *AG_Sens@mailbox.tu-dresden.de*

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DGSens
Deutsche Gesellschaft für Sensorik

Collection of Methods for Sensory Testing of Food Contact Materials

Name	Spatula
Family	kitchen aids (predominantly hot contact)
Sample images	
Definition	kitchen aids, mainly for turning food in a pan, however, foreseeable use is also analogous to a cooking spoon (e.g. stirring of sauces)
Typical materials	very common: metal, PA, seldom: other plastics or elastomers (e.g. silicone) (wooden spatula are excluded from this test instruction)
Possible odours	dependent on material: oxidized PP, oxidized PA, metallic
Sample preparation	If existent, preparation according to the instructions of the manu-facturer, if not existent, the articles should be cleaned with warm water (40°C) containing a common household liquid detergent.
Preliminary test	Evaluation of odour (possibly of test material cut into pieces) if necessary (e.g. in case of PA): Testing on transfer of odour after heating, DIN 10955:2004
Sensory testing conditions (compliance test)	– wetting contact with hot water ○ water, 0,5h/100°C (boiling or 100°C (in a drying oven) possible; for auditability indicate in the test report) ○ immerse in water in a lab beaker (high form) without immersing the handle (if clearly recognizable) ○ test volume: use high-form-beaker (depending on the size of the spatula); indicate the water volume and the covered surface in the test report ○ sensory testing of the water (odor and tasting) – wetting contact with hot fat (>150°C) possibly additional to “contact with hot water” ○ „plant oil/ fat“:0,5h/175°C, test procedure analogous to „wetting contact with hot water“ ○ specify the amount of fat per spatula (surface) in the test report
Miscellaneous	Contact conditions (amount and type of food simulants per spatula (surface), time and temperature of contact (open boiling or at 100°C in a drying oven) shall be indicated in the test report

AG Sensorik von Bedarfsgegenständen
Joint working group of EUROLAB-D and DGSens
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[1] **Huber et al. (2002)** Off-flavour release from packaging materials and its prevention: a foods company´s approach. Food Additives and Contaminants 19:221-228
[2] **TU Dresden** Order form for Odor References https://www.chm.tu-dresden.de/lc2/index-die.shtml
[3] **DIN EN 1230 (2010)** Paper and board intended to come into contact with foodstuffs - Sensory analysis - **Part 1: Odour - Part 2: Off-flavour (taint)**
[4] **DIN 10955 (2004)** Sensorische Prüfung – Prüfung von Packstoffen und Packmitteln für Lebensmittel
[5] **ISO 13302 (2003)** Sensory analysis - Methods for assessing modifications to the flavour of foodstuffs due to packaging
[6] **JRC (2009)** Guidelines on testing conditions for articles in contact with foodstuffs (with a focus on kitchenware). http://publications.jrc.ec.europa.eu/repository/bitstream/JRC51601/guidelines%20test%20conditions_final_ed2009.pdf
[7] **AG Sens (2016)** https://www.chm.tu-dresden.de/lc2/gremien-agsens_pub.shtml or http://www.dgsens.de/best-practice.html or http://eurolab-d.de/deutsch/dokumente/eurolab-d/methodensammlung-des-ak-sensorik/englische-fassung-methodensammlung-des-ak-sensorik.html

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