

Selected questions and answers about cookware and roastware with a non-stick coating

FAQ of 1 November 2005

Cookware with a non-stick coating: no sticking, easy to clean, low fat preparation. However, the coating does scratch easily. Food in coated pans and pots should, therefore, only be stirred with wooden or plastic spoons/spatulas. Polytetrafluoroethylene (PTFE) is frequently used as the coating material - known under the trademark Teflon.

A non-stick PTFE finish to cookware and roastware can pose a health threat if the coating is overheated. Then PTFE generates toxic fumes. When used properly, this risk does not occur.

BfR has compiled and answered below the most frequently asked questions about cookware and roastware with a non-stick coating.

What is PTFE?

PTFE is the abbreviation for polytetrafluoroethylene. This compound is used under various commercial names for instance for a non-stick finish to cookware, roastware and bakeware.

A slightly wax-like surface is the distinctive feature of PTFE-coated frying pans, baking tins and other cookware.

PTFE is a cold, heat and chemical resistant, non-stick plastic. PTFE is non-combustible. It decomposes when overheated. At temperatures above 360 °C fumes are released that are toxic to man.

Where else is PTFE used?

The non-stick finish to cookware, roastware and cookware is one of the best known applications for PTFE.

But there are many different applications for PTFE. Given its chemical stability, PTFE is primarily chosen in conjunction with aggressive chemicals. PTFE is used for the coating of hoses, seals and synthetic parts. PTFE is also used in aircraft production and the aerospace and apparel industries as well as in medical grafts, dental floss or piercing jewellery.

What should I pay attention to when cooking and roasting food in PTFE coated pots and pans?

To avoid overheating, empty coated pans and pots should never be heated for more than three minutes. Otherwise, temperatures on the hot burner could reach around 360 °C, the temperature at which PTFE begins to decompose and to release toxic fumes without giving off any smoke. Special caution should also be exercised in the case of induction cookers. They should never be heated when empty.

Once the cookware contains food, any overheating is very unlikely. The consumer is warned by the smell of "burning food" that the temperature is too high. There is no risk of toxic substances migrating to the food when the coated cookware is used correctly.

How can you tell when the non-stick coating of cookware is overheated?

If there is food in the pan or pot, then a smell develops and the food is burned to an inedible degree. When heating, for instance, oil in a coated pan, the development of smoke from about 270 °C is a warning of overheating.

What effect do the fumes generated during overheating have in animal experiments?

Approximately 202 °C was determined as the lowest critical temperature in animal experiments. At this temperature small PTFE particles already flake off which can have a lethal effect on birds. Given the different anatomy of their lungs, birds are far more sensitive than mammals or humans when they breathe in toxic substances. It is not, therefore, possible to transfer these data to man.

Temperatures of 425-450 °C are needed to form PTFE decomposition products that are lethal for rats. The 15-minute inhalation of ultrafine PTFE particles causes severe lung damage in rats.

What are the health risks to people from cookware or bakeware with a non-stick finish?

There is no threat to health when the coated cookware is used properly. Nor is there any threat when the smallest particles flake off from the scratched coating and are accidentally eaten. As particles of this kind are not absorbed but pass directly through the system, they cannot trigger any toxic reactions in the body.

However, BfR does issue a warning about incorrect use and overheating empty cookware and roastware. Already at temperatures of more than 360 °C toxic fumes are formed from fluoridated compounds and particles. If people inhale them, they can cause flu-like symptoms, so-called Teflon fever (polymer fever). Cases of illness have only, however, been reported from the industrial production of PTFE where the contaminant concentrations are higher than in private homes.