

Packaging or cooking utensils can they be used in microwave?

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The principle of microwave cooking

A microwave oven generates a magnetic field which causes a strong agitation of the water molecules present inside foods and this process leads to a very fast rise in temperature. The heat emission increases due to the presence of other molecules that act like brakes and hinder the water molecules moving. In the oven, the energy diffusion in microwaves form is irregular and thus prepared foods presents sometimes an alternation of cold and hot zones. Moreover, the heat produced in food subjected to the same electromagnetic field varies depending on their composition. The heat dissipation is done from the surface to the heart of the food.

Compared to a conventional oven, the cooking times are shorter in a microwave oven.

Regarding containers (packaging and cooking utensils), they are warmed by the heat dissipation from food to materials and not by the action of the microwaves.

Interrogations on the harmfulness of food thus heated

Questions arise about the safety of foods reheated in microwave ovens. According to the Canadian ministry in charge of health (Canada Health), the microwaves do not modify the chemical components of food and thus should not lead the formation of new components like carcinogen substances. Studies were conducted to analyze the possible undesirable effects of the microwave ovens on health. These studies, which were evaluated by the proper Canadian authorities, do not reveal any sign of toxicity or carcinogenicity.

Thus, problems of health and safety associated with cooking by microwaves are generally similar to those for other cooking modes. The risk is an excessive rise in temperature which may have several consequences:

- burns if the consumer is exposed to very hot parts of the container or food;
- Increasing of the transfer of components coming from the material of the container to foods by the chemical phenomenon of migration;
- Deterioration of the food nutrients;
- Physical alteration of materials in contact (for example the melting of a plastic or the geometrical deformation of packaging or cooking utensils).

A test bench dedicated to the study of the behavior of packaging or cooking utensils in microwave ovens

To meet the needs for the manufacturers of packaging and cooking utensils, LNE has developed a new specialized test bench to study the behavior of packaging or utensils in microwave ovens. The temperature of the container in contact with the food is measured at the interface using fiber optic sensors during reheating in a microwave oven. This equipment makes it possible to obtain the cartography of the temperature changes and to evaluate the strength of materials and items.

Two services are proposed by LNE:

- Determination of the temperature of plastics and objects at the interface plastics/foodstuffs during the heating in conventional oven or microwave to select the appropriate temperature for migration testing (standard EN 14233 – February 2003)
- Assessment of the strength of the materials or objects in plastic to microwave heating (standard EN 15284 – July 2007).

Research project with ANSES

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To enhance its experience on this subject, the LNE leads, in partnership with the French Safety Sanitary Agency (ANSES), an impact study on the migration of substances, reheating or cooking in microwave oven of frozen food or not in plastic containers (packaging or containers intended for food preparation or consumption). This study includes the following tasks:

- measure the temperatures at the interface of material/Food during reheating in a microwave oven to make cartographies;
- analyze the migration of substances resulting from plastics and subject to regulatory restrictions (SML) on use in food–simulating and under conditions of temperature, duration and repetition of the contacts corresponding to the food reheating in a microwave oven;
- build a knowledge base relating the temperature at the interface material/food with the plastic types, food types for given operating parameters of microwave ovens.

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