

## FOOD PHYSICS AS AN IMPORTANT PART OF FOOD SCIENCE AND APPLIED PHYSICS

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**Abstract.** The paper deals with the following topics:

- main fields of food science and applied physics,
- food physics as a new interdisciplinary field of science,
- important parts of food physics,
- some special questions (e.g. nondestructive testing, radiation methods) of food physics.

**Key words:** applied physics, food physics, food science, nondestructive testing, physical properties, radiation methods, rheology

### INTRODUCTION

The term “food physics” is not known enough in spite of the fact, that the constituent words (food and physics) have been used for thousands of years. Food physics is part of food science but belongs to applied physics, as well.

### MAIN FIELDS OF FOOD SCIENCE AND APPLIED PHYSICS

Development of various branches of science and establishment of new branches can be explained basically in 2 different ways: differentiation and integration. Of course, classification of various branches of science and differentiation (separation) of different fields is of artificial character, because in nature there are no borders between sciences, science is a continuous and correlated body of knowledge.

Anyway, for the sake of human brain (with limited abilities) differentiation and integration is created, and this separation is mainly based on a very rapid increase of knowledge.

Figure 1 shows some important sub-branches of food science and applied physics [5]. Of course, development of food science and applied physics is influenced by development of many other branches, e.g., agricultural or technical science, as well. Food physics is a bridge between food science and applied physics.

### FOOD PHYSICS AS A NEW INTERDISCIPLINARY BRANCH OF SCIENCE

Food physics as a new field of science, rather special, but typically interdisciplinary one. Food physics deals mainly with the following two topics [4]:

- investigation of the physical parameters of foodstuffs,
- investigation and treatment of foodstuffs with physical methods.

Of course if we use this term with a wider interpretation, food physics will cover a significant part of the R+D of food industry, because the base of measuring technique, mechanisation, instrumentation, automation, control and even robot-technique is the same: physics.

From the point of view of applied physics, it is possible to define food physics as a sum of physical methods, techniques and processes, applied in food industry. In other words, food physics - as compared to fundamental science - is a typical applied science, covering the problems of practical life.

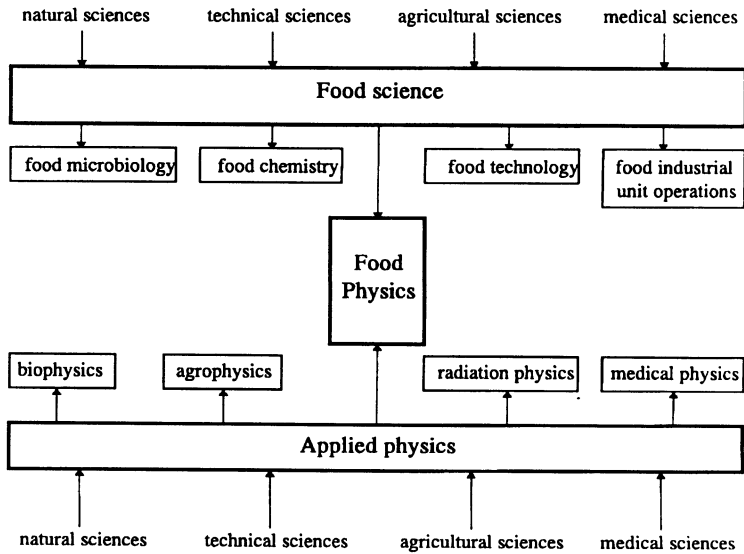


Fig. 1. Food physics as a subsience, belonging both to food science and applied physics.

There is a possibility to use also the term food in a wider sense not only for final food products, but also raw materials, additives etc., namely all the materials which are necessary for food production. In this case, some parts of agrophysics, - as it is also a typical frontier field-belong to food physics.

#### IMPORTANT PARTS OF FOOD PHYSICS

Food physics is a field of food investigation that applies physical methods. In 1992 a new scientific society, International Society of Physicists (ISFP) was established and the I<sup>st</sup> and II<sup>nd</sup> International Conferences on Food Physics were held in Budapest in 1994 and Bucharest in 1996. These conferences showed the most important topics in food physics. They were organised in the following working groups:

1. Rheology of foodstuffs, rheological measuring technique, rheological parameters.
2. Radioactivity of the foodstuffs, radiation methods in the food sector.
3. Nondestructive physical methods for the investigation of foodstuffs.
4. Physical methods in food processing.

5. Basic questions, theoretical background of food physics, connection with other branches of science.

6. Technical development, instrumentisation, measuring technique, automation, control of food industry.

#### SOME SPECIAL QUESTIONS OF FOOD PHYSICS

There are many instrumental, analytical techniques which are suitable for food investigation as well. These are partly physical or nuclear physical methods giving a possibility also for the application of nondestructive testing in many cases. Let us mention some non-destructive methods which will probably have an increasing importance in the future:

- NMR-technique for rapid fat and oil determination,
- NIR-NIT spectrometry for the measurement of main constituents of foodstuffs,
- INAA and XRF technique for the determination of elemental composition,
- DSC method for studying different processes (e.g., heat denaturation of proteins).

Analyses of relations between the results of rheological measurements and sensory evaluation of foodstuffs [2] (Fig. 2) can be a very interesting issue.

Radiation techniques - including ionizing and non-ionizing radiation - are widely used in various fields of food sector (e.g., tracer te-

chnique, radiostimulation, radiomutation, food preservation). Since 1986 (Chernobyl disaster) radioactive contamination (e.g.,  $^{137}\text{Cs}$ ) of foodstuffs is again of great importance [3].

Let us finally mention the books by Mohsenin [1] concerning different physical parameters of foodstuffs and agricultural materials.

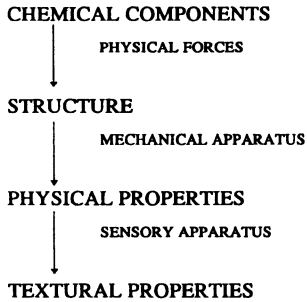


Fig. 2. Relations between texture, physical properties and structure.

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