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# Materials, technologies and industrial plants A

## Finalità

The aim of this course is to provide cross-disciplinary and specific competences about analysis and selection of packaging materials, technologies and plants for food products.

The state of the art and future developments of technical, technological and economics features are discussed.

## Programma

INTRODUCTION. Definition of terms. Aims and characteristics of packaging operations.

CHEMICAL PROPERTIES. Chemical structure, characteristics and resistance of materials.

PHYSICAL PROPERTIES. Thermal and optical properties of materials. Behaviour of materials exposed to ionizing radiation. Behaviour of materials exposed to microwaves. Mechanical properties.

MIGRATION PHENOMENA. Interaction phenomena. Migration mechanisms. Migration forecasting.

PERMEABILITY OF GASES AND VAPOURS. Permeation mechanism. Permeability measure parameters. Measurement techniques of permeability to gases. Measurement techniques of permeability to steam.

PACKAGING MATERIALS. Glass. Ceramics and other earthenwares. Metals. Aluminium. Tin plate and other coated steels. Stainless steel. Metal corrosion. Cellulosic materials. Paper and cardboard. Cellophane – Regenerated cellulose. Plastics.

THE SHELF-LIFE. Problem formulation. Basic strategy in the shelf-life study. Chemistry kinetics laws. Zero order kinetics. Reaction rate and temperature. Shelf-lives at variable temperature. Non linear dependence of the rate of reaction. Packaging characteristics. Shelf-life and oxygen transmission. Shelf-life and moisture transmission. Shelf-life and materials substitution.

## Modalità d'esame

Oral examination.

## Testi consigliati

Notes of lessons and different authors.