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## Materials, technologies and industrial plants B

### 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

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

SUITABILITY OF PACKAGING FOR FOOD. Food suitability of packages. Composition suitability. Migration limits. Sensory suitability. Labels.

PACKAGING TYPE. Glass and plastics bottles. CEE bottles. Production systems. Closing tools. Metallic packages: metallic boxes, double seaming, external protection. Deformable tubes. Aerosol packages. Kegs. Aluminium sheets.

FLEXIBLE PACKAGING. Films productions systems. Films finishing operations. Composite structures. Production techniques. Composite structures permeability. Flexible packaging typology.

STAMP AND CODES. Systems, techniques and characteristics of stamps. Ink types. Bar codes and EAN standards.

LABELS. Law regulations; metrological regulation. Verification of package content.

CONAI ENVIRONMENTAL CONTRIBUTION. Introduction. Definition of terms. Single materials environmental contribution.

PACKAGING TECHNOLOGIES. Hot filling. Aseptic conditioning or pre-sterilization. Sanification of materials and packages. Thermal post-sterilization with microwaves, ionizing radiations and high pressure. Atmosphere modifications. Hypo-baric conditioning. Packaging in modified or protective atmosphere. Active and intelligent packaging.

### Attività d'esercitazione

Project of a packaging system, technology or plant.

### Modalità d'esame

Oral examination and project discussion.

### Testi consigliati

Notes of lessons and different authors.