

SHRINKAGE

Shrinkage can be defined as "Shrinkage is the decrease in volume of the food during processing such as drying. When moisture removed from food during drying, there is a pressure imbalance between inside and outside of the food. This generates contracting stresses leading to material shrinkage or collapse. Shrinkage is also defined as the percent change from the initial apparent volume for example moisture loss during drying, ice formation during freezing and formation of pores by puffing.

Apparent shrinkage is defined as the ratio of the apparent volume at a given moisture content to the initial apparent volume of materials before processing.

$$S_{app} = V_{app} / V_{app0}$$

where

V_{app} = apparent volume at a given moisture content (m^3),

V_{app0} = Initial apparent volume (m^3).

Shrinkage occurs because biopolymers cannot support their weight in the absence of water. Shrinkage is the result of capillary collapse a normal occurrence as fluid is evaporated or removed from capillaries.

Types of Shrinkage

Two types of shrinkage are usually observed in food materials

- Isotropic shrinkage
- Anisotropic shrinkage

1. **Isotropic Shrinkage:** Isotropic shrinkage can be described as uniform shrinkage in all geometric dimensions of material. Example: isotropic shrinkage observed in most of fruits and vegetables.
2. **Anisotropic shrinkage:** If there is a non-uniform shrinkage in all dimensions of the material, it is called anisotropic shrinkage. Example: shrinkage in fish and seafood as shrinkage in parallel muscle is significantly different from perpendicular muscle shrinkage

Impact of shrinkage on Food

Shrinkage is an important phenomenon impacting dried food product by reducing product

- > wetability ↓
- > change product texture ↓
- > decrease product absorbency

Factors affect shrinkage process

Shrinkage of food depends on

- Internal pressure
- Environmental pressure
- Variation in moisture transport mechanism
- Porosity
- Capillary force
- Surface tension
- Structure of food item

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