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**Protein Thermal Denaturation of Beef Muscle: Neutron Imaging and Spectroscopies**

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**Context of Project**

Open Food System is an academic and industrial projet with the purpose to follow meat cooking without any intrusion.

It concerns two main parts

1) Sensor Development
   - a) Spectroscopic Sensor
     - Visible / InfraRed
     - Fluorescence
   - b) Olfactometer Sensor

2) Biochemistry of Muscle Cooking
   - Food Science Approach:
     - Macroscopic scale
     - Sensory Analysis
     - Colour
     - Texture
     - Flavour
   - Our Approach:
     - Microscopic scale (Neutron Imaging)
     - Molecular scale (Spectroscopies)

**Neutron Imaging during Cooking**

Neutron Imaging was used to follow muscle morphology changes (protein contraction) and juice migration inside the sample (through the evolution of Attenuation Coefficient).

**Spectroscopies: IR and Fluorescence**

InfraRed and Fluorescence were carried out on muscle samples with the purpose to detect the spectroscopic signature of proteins at a particular cooking degree.

Calorimetry
Used to determine the cooking temperature parameters for the samples

InfraRed Spectra
Principal Component Analysis - InfraRed
Separation on Cooking Degree:
- Beef: LT ≠ MT and HT

Fluorescence Spectra (ex. 291 nm)
Principal Component Analysis - Fluorescence
Separation on Cooking Degree:
- Beef: LT ≠ MT and HT

**Future**

Microscopic Scale on Neutron Imaging:
- Coupling Neutron Imaging with Surface Spectroscopies (IR and Fluorescence) during heating Process

Molecular Scale:
- Myosin Thermal Denaturation depending on ionic strength (KCl)
- Structural Studies by IR, Fluorescence and SANS spectroscopy

**References**

Chen et al., 322 (5907), 1494-1497 (Science)