



TEXAS FOOD SAFETY **ENGINEERING**

Irradiating for safety

TFSE-BAEN-COALS-TAMU

The Texas Food Safety Engineering is a research group at Texas A&M University dedicated to solve problems related to food safety issues.



Food engineering graduate student Carmen Gomes searches for new ways to keep fruits and vegetables safer and fresher for longer. Methods include irradiating the produce with a burst of energy and novel packaging.

Biological & Agricultural Engineering

The Food Safety Engineering is a research group at Texas A&M University dedicated to solve problems related to food safety issues.

We are interested in the application of sound engineering principles to design efficient irradiation treatments for fresh produce as well as meat and other food products using electron beam technology.

The emphasis is on developing dosimetry plans using

sophisticated imaging and computing simulation techniques to assure uniform dose throughout the food.

Due to the rise in illnesses, and some deaths, caused by consumption of unsafe food products in the United States and around the world, we are looking for alternative technologies to treat food products for safety purposes.

Our objective is to develop a technology that will help our food supply to be safer by

preventing, treating, and predicting foodborne contaminations. If you are interested in knowing more about this program please contact us.

Faculty - Directors

Dr. Rosana G. Moreira

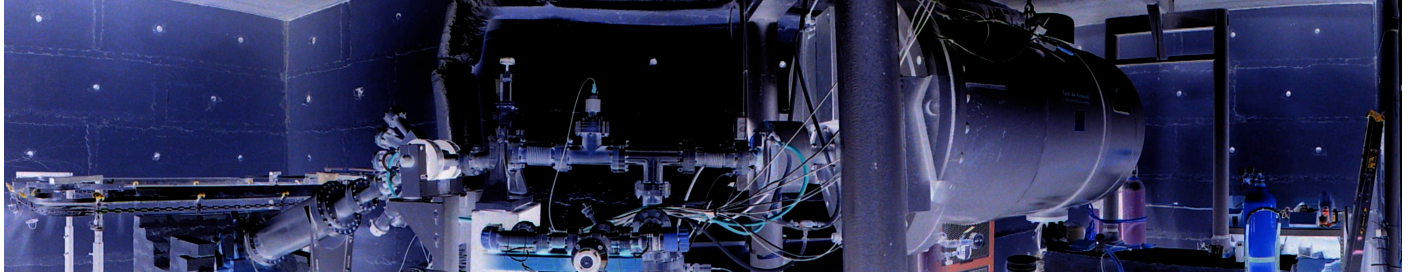
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For more information on this program go to this site
<http://moreira.tamu.edu/FSEngr/FSENGR.html>

TFSE-CAPABILITIES



This facility has a 2 MeV Van de Graaff Accelerator that can generate current up to 250 μA of electrons at specific selected energies between 0.75 and 2 MeV. At the highest energy, 2 MeV, the beam power can be adjusted to 100 watts and delivered to a target area of 100 square centimeters of unit density of material, providing a dose of 1.0 kGy.

The capabilities of the Van de Graaff accelerator:

- Fundamental research
 - used for 60 years at radiation research facilities (nuclear physics, radiation therapy, and food processing)
- Flexible experimental setup
- Flexible sample location
- Controllable electron's kinetic energy
- Controllable dose rate
- Capable of multi-processes (heating/cooling plus irradiation)
- Research of micro-level radiation effect of sample with high-quality beams and high terminal energy stability of Van de Graaff

Research capabilities of facility:

- **Dosimetry - dose measurement**
 - ion-chamber (absolute, std method)
 - radio-chromic film
 - Dose calculation of sample down to micro-scale using Monte Carlo simulation
- **Inactivation of microorganisms**
 - bio-hazard II lab access
 - D_{10} value determination with accuracy to the micro-level
 - anti-microbial packages and nano-encapsulation of anti-microbial agents
 - modified atmospheric package for ozone production during radiation
- **Quality assessment**
 - physical properties - color, a_w , density, etc.
 - thermal properties - k , C_p , α
 - rheological properties - texture, viscosity
 - chemical - nutraceuticals
 - shelf-life analysis
 - sensory evaluation

Research Topics:

- Irradiation of complex shaped food products using e-beam technology
- Use of Monte Carlo and CT scan techniques for dose calculation in food products
- Use of chemical phantom sensors for dose measurement in food products
- On-line simulator of e-beam irradiation of food products
- Modeling of kinetics of food components during radiation
- Modeling of microorganisms destruction during food irradiation
- Radio-sensitizers
- Smart packages
- Risk assessment of implementating e-beam technology
- Radiation thermo-cracking for heavy oils

Table 1: Number of graduate students and publications from 2003-present

Output	Number
Master Students	4
PhD Students	6
Publications	
peer-reviewed	35
others	50

Personnel Capabilities - training

- **Post-Doctor - Dr. Jongsoon Kim**
 - radiation physics
 - dosimetry
 - radio-chromic film
 - ion-chamber
 - alanine
 - Monte Carlo simulation for dosimetry
 - Food engineering - food irradiation
 - Van de Graaff expert - operation, maintenance
- **PhD student - Paulo Da Silva**
 - radiation physics
 - dosimetry (same as above)
 - bio-chemical/physical analysis of food products
 - Food engineering - food irradiation
 - Van de Graaff expert - operation, maintenance