Porosity and density measurements of sodium acetate trihydrate for thermal energy storage

Sodium acetate trihydrate (SAT) can be used as phase change material in latent heat storage with or without utilizing supercooling. The change of density between liquid to solid state leads to formation of cavities inside the bulk SAT during solidification. Samples of SAT which had solidified from supercooled state at ambient temperature and samples which had solidified with a minimal degree supercooled were investigated. The temperature dependent densities of liquid and the two types of solid SAT were measured with a density meter and a thermomechanical analyzer. The cavities formed inside samples of solid SAT, which had solidified after a high or minimal degree of supercooling, were investigated by X-ray scanning and computer tomography. The apparent density of solid SAT depended on whether it solidified from a supercooled state or not. A sample which solidified from a supercooled liquid contained 15% cavities and had a density of 1.26 g/cm³ at 25 °C. SAT which had solidified with minimal supercooling contained 9% cavities and had a density of 1.34 g/cm³ at 25 °C. The apparent densities of the solid SAT samples were significantly lower than the value of solid SAT reported in literature of 1.45 g/cm³. The density of liquid and supercooled SAT with extra water was also determined at different temperatures.
Layered Surface Detection in Micro-CT Tetra Pak Data

General information
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The Traveling Optical Scanner – Case Study on 3D Shape Models of Ancient Brazilian Skulls

Recovering detailed morphological information from archaeological or paleontological material requires extensive hands-on time. Creating 3D scans based on e.g. computed tomography (CT) will recover the geometry of the specimen, but can inflict bimolecular degradation. Instead, we propose a fast, inoffensive and inexpensive 3D scanning modality based on structured light, suitable for capturing the morphology and the appearance of specimens. Benefits of having 3D models are manifold. The 3D models are easy to share among researchers and can be made available to the general public. Advanced morphological modelling is possible with accurate description of the specimens provided by the models. Furthermore, performing studies on models reduces the risk of damage to the original specimen. In our work we employ a high resolution structured light scanner for digitalizing a collection of 8500 year old human skulls from Brazil. To evaluate the precision of our setup we compare the structured light scan to micro-CT and achieve submillimetre difference. We analyse morphological features of the Brazilian skulls using manual landmarks, but a research goal is to automate this, fully utilize the dense 3D scans, and apply the method to many more samples.

Comparison of a multispectral vision system and a colorimeter for the assessment of meat color

The color assessment ability of a multispectral vision system is investigated by a comparison study with color measurements from a traditional colorimeter. The experiment involves fresh and processed meat samples. Meat is a complex material; heterogeneous with varying scattering and reflectance properties, so several factors can influence the instrumental assessment of meat color. In order to assess whether two methods are equivalent, the variation due to these factors must be taken into account. A statistical analysis was conducted and showed that on a calibration sheet the two instruments are equally capable of measuring color. Moreover the vision system provides a more color rich assessment of fresh meat samples with a glossier surface, than the colorimeter. Careful studies of the different sources of variation enable an assessment of the order of magnitude of the variability between methods accounting for other sources of variation leading to the conclusion that color assessment using a multispectral vision system is superior to traditional colorimeter assessments. (C) 2014 Elsevier Ltd. All rights reserved.
Fresh meat color evaluation using a structured light imaging system
The objective of this study was to investigate the efficacy of a computer vision system (CVS) with structured light for meat color assessment. Three muscles (longissimus dorsi (LD), semimembranosus (SM), and psoas major (PM)) from eight beef carcasses were obtained at 1 day postmortem, vacuum packaged and assigned to three aging periods (9, 16, and 23 days). After aging, steaks were cut and displayed for 7 days at 3 °C under light. The surface colors were evaluated by using a Minolta, the CVS and trained color panel. In general, the CVS was highly correlated to the sensory scores, and showed an equivalent meat color assessment compared to the colorimeter. The CVS had a significantly higher correlation with the panel scores for the lighter and more color stable samples compared to the colorimeter. These results indicate that the CVS with structured light could be an appropriate alternative to the traditional colorimeter by offering improved precision and accuracy over the colorimeter.

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Multispectral Imaging of Meat Quality - Color and Texture

The use of computer vision systems in food production and development is increasing. Computer vision systems offer fast, reliable, objective and noninvasive methods for assessment of wanted quality traits.

This thesis investigates the applicability of computer vision systems in the assessment of meat quality parameters, especially with regards to meat color and texture. Several image modalities have been applied, all considering multi- or hyper spectral imaging.

The work demonstrates the use of computer vision systems for meat color measurements. The color is assessed by suitable transformations to the CIELAB color space, the common color space within food science. The results show that meat color assessment with a multispectral imaging is a great alternative to the traditional colorimeter, i.e. the vision system meets some of the limitations that the colorimeter possesses. To mention one, it is possible to assess color of very complicated structures, such as salamis, with a vision system. More importantly though, the vision system embraces the complicated scattering properties of meat.

The images can also lead to other analyses, e.g. image texture analysis relating to the structure of the meat. In the thesis it is presented how simple texture measures can be used for characterizing the texture changes in fermented salamis. Moreover, it was investigated if it was possible to relate structure in images to chemical compounds in lard from boars.
A Comparison of Meat Colour Measurements From a Colorimeter and Multispectral Images

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Utilization of Multispectral Images for Meat Color Measurements
This short paper describes how the use of multispectral imaging for color measurement can be utilized in an efficient and descriptive way for meat scientists. The basis of the study is meat color measurements performed with a multispectral imaging system as well as with a standard colorimeter. It is described how different color spaces can enhance the purpose of the analysis - whether that is investigation of a single sample or a comparison between samples. Moreover the study describes how a simple segmentation can be applied to the multispectral images in order to reach a more descriptive measure of color and color variance than what is obtained by the standard colorimeter.

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3D imaging center
Department of Physics
Neutrons and X-rays for Materials Physics
Department of Applied Mathematics and Computer Science
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Department of Energy Conversion and Storage
Imaging and Structural Analysis
Electrofunctional materials
Centre for oil and gas – DTU
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Number of participants: 14
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Related projects:
Alliance for Imaging and Modelling of Energy Applications
Publications:
Powder embossing method for selective loading of polymeric microcontainers with drug formulation
Crack Tip Flipping under Mode I Tearing: Investigated by X-Ray Tomography
In-Situ X-ray Tomography Study of Cement Exposed to CO₂ Saturated Brine
Graphite nodules in fatigue-tested cast iron characterized in 2D and 3D
Scene reassembly after multimodal digitization and pipeline evaluation using photorealistic rendering
From concept to in vivo testing: Microcontainers for oral drug delivery
Synthesis and characterization of Fe–Ni/γ-Al₂O₃ egg-shell catalyst for H₂ generation by ammonia decomposition
Microstructure and micromechanics of the heart urchin test from X-ray tomography
Surface Detection using Round Cut
Characterization of graphite nodules in thick-walled ductile cast iron
High-Performance Microchanneled Asymmetric Gd₀.₁Ce₀.₉O₁.₉₅–δ–La₀.₆Sr₀.₄FeO₃–δ-Based Membranes for Oxygen Separation
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Spectral imaging of meat quality - color, texture and structure
Department of Applied Mathematics and Computer Science
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Number of participants: 6
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