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Quantitative texture analysis comparison of three legumes

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A validated texture-analysis method to evaluate product quality in frozen or cooked legumes is needed to support high-quality vegetable production but is not currently established in the literature. Peas, lima beans, and edamame were investigated in this study due to similar market use as well as growth in plant-based protein consumption in the United States. These three legumes were evaluated after three different processing treatments (blanch/freeze/thaw (BFT); BFT+microwave heat (BFT+M); BF+stove-top cooking (BF+C)), using both compression and puncture analysis following an American Society of Agricultural and Biological Engineers (ASABE) texture analysis method and moisture testing following an American Society for Testing and Materials (ASTM) standard method. Texture analysis results showed differences between legumes and processing methods. Compression analysis identified more differences between treatments within product type than puncture for both edamame and lima beans indicating compression might be more sensitive to texture changes in these products. Implementation of a standard texture method for legume vegetables for growers and producers would provide a consistent quality check to support efficient production of high-quality legumes. Due to the sensitivity obtained from the compression texture method in this work, compression should be considered for future research into a robust method to evaluate edamame and lima bean textures throughout the growing and production processes.

KEYWORDS

texture, legume, vegetables, quality, compression, puncture

1 Introduction

Consumer acceptance, market value, and overall usefulness of food ingredients including vegetables and products are dependent on texture, which is highly influenced by growing and storage conditions as well as processing methods and techniques (Armfield and Maskus, 2011). Properties of processed and raw fresh foods, such as legume vegetables, change over time due to microbial actions, oxidation, moisture migration and other factors, making accurate and complete understanding of the mechanical properties of foods, especially raw foods, difficult (Lu and Abbott, 2004). Quantification of quality attributes,

Quantitative Texture Analysis

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Quantitative Texture Analysis:

Quantitative Texture Analysis Hans Joachim Bunge, C. Esling, Deutsche Gesellschaft für Metallkunde, 1986

Quantitative Texture Analysis Hans-Joachim Bunge, 1982 *Quantitative Texture Analysis* Hans Joachim Bunge, C. Esling, University of Metz. Laboratoire de Métallurgie Structurale, Technische Universität Clausthal. Institut für Metallkunde und Metallphysik, 1982 **Quantitative texture analysis in multiphase materials with overlapping Bragg reflections**, 1988 **Model Investigation of the Grain Number to Apply Quantitative Texture Analysis Averaging** T. A.

Lyčagina, D. I. Nikolaev, 2002 **Advances and applications of quantitative texture analysis**, 1991 *The iterative series expansion method for quantitative texture analysis* Michael Dahms, Hans J. Bunge, 1989 **Advances and**

Applications of Quantitative Texture Analysis Hans Joachim Bunge, C. Esling, 1991 *Quantitative Texture Analysis Using Time-of-flight Neutron Diffraction and Electron Back Scatter Diffraction* Yanxia Xie, 2002 *Quantitative Texture Analysis by X-Ray Diffraction* R. H. Olsen, BOEING CO RENTON WASH COMMERCIAL AIRPLANE DIV., 1970

Techniques have been developed to quantitatively plot pole figures using x ray diffraction Corrections are made for background and defocusing effects and the data is converted from angular coordinates to orthogonal coordinates using stereographic mapping equations The x ray data is taken using a modified Siemens Pole Figure Goniometer and plotting is done via CDC 6600 and SC 4020 processing Calculation of an anisotropy index $K_{sub A}$ is made from the basal plane pole figures of titanium and empirically related to mechanical properties A THOR The Iterative Series-expansion Method for

Quantitative Texture Analysis M. Dahms, H. J. Bunge, 1989 **Introduction to Texture Analysis** Olaf Engler, 2009-11-16

The first edition of Introduction to Texture Analysis Macrotexture Microtexture and Orientation Mapping broke new ground by collating seventy years worth of research in a convenient single source format Reflecting emerging methods and the evolution of the field the second edition continues to provide comprehensive coverage of the concepts Biomedical Texture Analysis Adrien Depeursinge, Omar S Al-Kadi, J. Ross Mitchell, 2017-08-25 Biomedical Texture Analysis Fundamentals Applications Tools and Challenges describes the fundamentals and applications of biomedical texture analysis BTA for precision medicine It defines what biomedical textures BTs are and why they require specific image analysis design approaches when compared to more classical computer vision applications The fundamental properties of BTs are given to highlight key aspects of texture operator design providing a foundation for biomedical engineers to build the next generation of biomedical texture operators Examples of novel texture operators are described and their ability to characterize BTs are demonstrated in a variety of applications in radiology and digital histopathology Recent open source software frameworks which enable the extraction exploration and analysis of 2D and 3D texture based imaging biomarkers are also presented This book provides a thorough background on texture analysis for graduate students and biomedical engineers from both industry and academia who have basic image processing knowledge Medical doctors and biologists with no background in image

processing will also find available methods and software tools for analyzing textures in medical images Defines biomedical texture precisely and describe how it is different from general texture information considered in computer vision Defines the general problem to translate 2D and 3D texture patterns from biomedical images to visually and biologically relevant measurements Describes using intuitive concepts how the most popular biomedical texture analysis approaches e g gray level matrices fractals wavelets deep convolutional neural networks work what they have in common and how they are different Identifies the strengths weaknesses and current challenges of existing methods including both handcrafted and learned representations as well as deep learning The goal is to establish foundations for building the next generation of biomedical texture operators Showcases applications where biomedical texture analysis has succeeded and failed Provides details on existing freely available texture analysis software helping experts in medicine or biology develop and test precise research hypothesis

Combined Analysis Daniel Chateigner, 2013-03-04 This book introduces and details the key facets of Combined Analysis an x ray and or neutron scattering methodology which combines structural textural stress microstructural phase layer or other relevant variable or property analyses in a single approach The author starts with basic theories related to diffraction by polycrystals and some of the most common combined analysis instrumental set ups are detailed Powder diffraction data treatment is introduced and in particular the Rietveld analysis is discussed The book also addresses automatic phase indexing a necessary step to solve a structure ab initio Since its effect prevails on real samples where textures are often stabilized quantitative texture analysis is also detailed Also discussed are microstructures of powder diffraction profiles quantitative phase analysis from the Rietveld analysis residual stress analysis for isotropic and anisotropic materials specular x ray reflectivity and the various associated models Finally the book introduces the combined analysis concept showing how it is superior to the view presented when we look at only one part of the analyses This book shows that the existence of texture in a specimen can be envisaged as a way to decouple ordinarily strongly correlated parameters as measured for instance in powder diagrams and to examine and detail deeper material characterizations in a single methodology

Tables for Texture Analysis of Cubic Crystals J. Hansen, J. Pospiech, K. Lücke, 1978-09-01 Recent progress in the material sciences has led to an increasing amount of interest in the role of textures for the behaviour of materials and in the mechanisms controlling the texture formation This development was supported by a rather powerful development taking place in the area of texture studies itself Besides the usual more qualitative characterization of a texture by pole figures a fully quantitative description by a three dimensional orientation distribution function ODF has been increasingly applied There are two sides to the problem of quantitative representation of textures One involves the mathematical technique associated with the acquisition of an ODF and its transforms from the experimental data whereas the other concerns the methods of a rational description and interpretation of an ODF The first side can be considered from the practical point of view as experimental data processing which is accomplished by a computer and is sort of a continuation

of the measurement itself Much attention has been paid to this problem particularly by Bunge who has written up achievements in this field in this extensive monograph 1 and in conference proceedings 2 There is also available a rather detailed presentation of a system of subroutines written in Fortran 3 which allows standard computations to be made without having to go into the mathematical details of the method *Quantitative Texture Analysis of T2-related MR Images in Polymyositis and Dermatomyositis Patients* Yuan Xie,2017 *Deformation Mechanisms, Rheology and Tectonics* Siese de Meer,2002 The motion and deformation of rocks are processes of fundamental importance in shaping the Earth from outer crustal layers to the deep mantle Reconstructions of the evolution of the Earth therefore require detailed knowledge of the geometry of deformation structures and their relative timing of the motions leading to deformation structures and of the mechanisms governing these motions This volume contains a collection of 22 papers on field experimental and theoretical studies that add to our knowledge of these processes *Tables for Texture Analysis of Cubic Crystals* J. Hansen,J. Pospiech,K. Lücke,1978 Recent progress in the material sciences has led to an increasing amount of interest in the role of textures for the behaviour of materials and in the mechanisms controlling the texture formation This development was supported by a rather powerful development taking place in the area of texture studies itself Besides the usual more qualitative characterization of a texture by pole figures a fully quantitative description by a three dimensional orientation distribution function ODF has been increasingly applied There are two sides to the problem of quantitative representation of textures One involves the mathematical technique associated with the acquisition of an ODF and its transforms from the experimental data whereas the other concerns the methods of a rational description and interpretation of an ODF The first side can be considered from the practical point of view as experimental data processing which is accomplished by a computer and is sort of a continuation of the measurement itself Much attention has been paid to this problem particularly by Bunge who has written up achievements in this field in this extensive monograph 1 and in conference proceedings 2 There is also available a rather detailed presentation of a system of subroutines written in Fortran 3 which allows standard computations to be made without having to go into the mathematical details of the method *Textures of Materials - ICOTOM 14* Paul van Houtte,Leo Kestens,2005-09-15 Proceedings of the 14th International Conference on Textures of Materials July 11th 15th 2005 Leuven Belgium **International Tables for Crystallography, Volume H** Christopher J. Gilmore,James A. Kaduk,Henk Schenk,2019-09-16 Die Pulverdiffraktion ist in der Kristallographie die am weitesten verbreitete Methode Die Anwendungen umfassen sämtliche Bereiche der Strukturwissenschaften Dieser neue Band aus der Reihe International Tables deckt alle Aspekte des Verfahrens in über 50 Kapiteln ab Autoren sind Experten des Fachgebiets Dieser Band umfasst sieben Teile mit folgenden Inhalten Überblick über die Prinzipien der Pulverdiffraktion Erläuterung der bei der Pulverdiffraktion eingesetzten Strahlungsquellen Instrumente und Ausrüstung Einsatz unterschiedlicher Probenumgebungen und Methoden der Probenvorbereitung Information zu Methoden einschließlich Datenverarbeitung

Indexierung und Reduktion Whole Pattern Modellierung und quantitative Analyse sowie Überblick über die relevanten Datenbanken der Kristallographie Fokus auf Strukturbestimmung einschließlich Methoden im realen und reziproken Raum sowie Methode der maximalen Entropie Strukturverfeinerung und Strukturvalidierung Erläuterung von Defekten Textur Mikrostruktur und Fasern einschließlich Belastung und Beanspruchung Domänen und Dünnschichten Untersuchung der für die Pulverdiffraktion verfügbaren Software Beschreibung der Anwendungsmöglichkeiten in vielen wichtigen Bereichen Industrie und Wissenschaften einschließlich Makromoleküle Mineralien Keramik Zement Polymere Forensik Archäologie und Pharmazeutika sowie Erklärung von Theorie und Anwendungen Band H ist das wichtigste Referenzwerk für alle die im Bereich Pulverdiffraktion tätig sind ob Anfänger und erfahrener Praktiker wurde für die Praxis entwickelt ohne Sorgfalt und Genauigkeit zu vernachlässigen Die Methode der Pulverdiffraktion wird anhand vieler Beispiele ausführlich behandelt Die Beispieldaten stehen teilweise als Download zur Verfügung

Quantitative Texture Analysis Book Review: Unveiling the Power of Words

In a global driven by information and connectivity, the ability of words has are more evident than ever. They have the ability to inspire, provoke, and ignite change. Such may be the essence of the book **Quantitative Texture Analysis**, a literary masterpiece that delves deep in to the significance of words and their affect our lives. Written by a renowned author, this captivating work takes readers on a transformative journey, unraveling the secrets and potential behind every word. In this review, we shall explore the book is key themes, examine its writing style, and analyze its overall affect readers.

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