

Application of Scanning Acoustic Microscopy for Detection of Dental Caries Lesion

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Abstract

Introduction: A scanning acoustic microscope (SAM) is an apparatus for imaging acoustic properties. This apparatus can non-invasively and rapidly evaluate the hardness of materials in the elastic region. This device shows great potential for the diagnosis of dental caries in the clinical setting. However, since the tissue elastic modulus measured using a SAM is a property of the elastic region and the Knoop hardness is a property of the plastic region, the hardness properties differ completely. Therefore, we investigated whether the acoustic impedance measured using a SAM is related to the Knoop hardness, which is used as the standard for removal of carious dentin. **Method:** Polished sections were prepared from 20 extracted carious wisdom teeth. The acoustic impedance and Knoop hardness were measured for each section. In addition to comparing carious and healthy dentin in SAM images, we evaluated the difference between the carious and healthy dentin in terms of the acoustic impedance and Knoop hardness. We also evaluated the correlation between the Knoop hardness and acoustic impedance. **Results:** The SAM images were visualized as two-dimensional color images based on the acoustic impedance values. The mean acoustic impedance of carious dentin was significantly lower than that of healthy dentin, showing a similar trend as Knoop hardness. A strong correlation was observed between the two. **Discussion:** The acoustic impedance values obtained through acoustic microscopy differed significantly between carious and sound dentin. Both types of

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Table of Contents Selected Papers On Scanning Acoustic Microscopy

1. Understanding the eBook Selected Papers On Scanning Acoustic Microscopy
 - The Rise of Digital Reading Selected Papers On Scanning Acoustic Microscopy
 - Advantages of eBooks Over Traditional Books
2. Identifying Selected Papers On Scanning Acoustic Microscopy
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Selected Papers On Scanning Acoustic Microscopy
 - User-Friendly Interface
4. Exploring eBook Recommendations from Selected Papers On Scanning Acoustic Microscopy
 - Personalized Recommendations
 - Selected Papers On Scanning Acoustic Microscopy User Reviews and Ratings

- Selected Papers On Scanning Acoustic Microscopy and Bestseller Lists
- 5. Accessing Selected Papers On Scanning Acoustic Microscopy Free and Paid eBooks
 - Selected Papers On Scanning Acoustic Microscopy Public Domain eBooks
 - Selected Papers On Scanning Acoustic Microscopy eBook Subscription Services
 - Selected Papers On Scanning Acoustic Microscopy Budget-Friendly Options
- 6. Navigating Selected Papers On Scanning Acoustic Microscopy eBook Formats
 - ePub, PDF, MOBI, and More
 - Selected Papers On Scanning Acoustic Microscopy Compatibility with Devices
 - Selected Papers On Scanning Acoustic Microscopy Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Selected Papers On Scanning Acoustic Microscopy
 - Highlighting and Note-Taking Selected Papers On Scanning Acoustic Microscopy
 - Interactive Elements Selected Papers On Scanning Acoustic Microscopy
- 8. Staying Engaged with Selected Papers On Scanning Acoustic Microscopy
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Selected Papers On Scanning Acoustic Microscopy
- 9. Balancing eBooks and Physical Books Selected Papers On Scanning Acoustic Microscopy
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Selected Papers On Scanning Acoustic Microscopy
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Selected Papers On Scanning Acoustic Microscopy
 - Setting Reading Goals Selected Papers On Scanning Acoustic Microscopy
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Selected Papers On Scanning Acoustic Microscopy
 - Fact-Checking eBook Content of Selected Papers On Scanning Acoustic Microscopy
 - Distinguishing Credible Sources

13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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