

## Size dependent optical properties of nanostructured Cu<sub>2</sub>O thin films

N. Sajid Babu

January 2023, American Institute of Physics

DOI: 10.1063/5.0136672

# Size-dependent properties of Nanostructured thin films

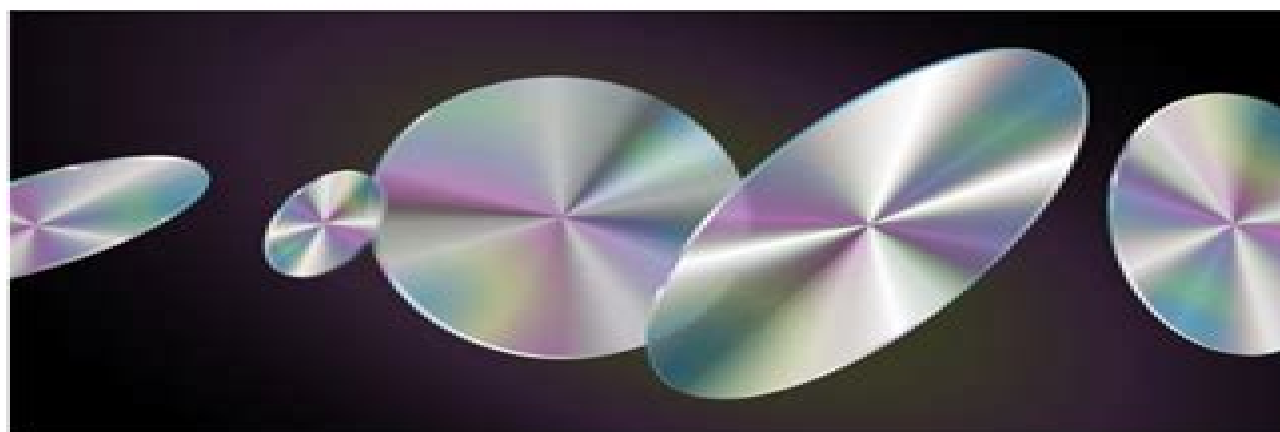


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### What is it about?

Cu<sub>2</sub>O nanocrystal (NC) films of different nanocrystal sizes were synthesized using vacuum deposition. The structure of the films was analyzed using the X-ray Diffraction (XRD) method. The transmittance for the samples increased with the annealing temperature.

### Why is it important?

We have studied the deposition of nanostructured thin films and their size-dependent properties. It is beneficial for the optoelectronic applications.

### Perspectives



**Dr. SAJID BABU NALAKATH**  
Mahatma Gandhi University

This article deals with the size-dependent studies of nanostructured Cu<sub>2</sub>O thin films. This article is essential for understanding the usefulness of nanostructured thin films in optoelectronic applications.

# Optical Properties Of Nanostructured Random Media

**Franz X. Kärtner**



## **Optical Properties Of Nanostructured Random Media:**

Optical Properties of Nanostructured Random Media Vladimir M. Shalaev, 2003-07-01 The contributors to the book are world best experts in the optics of random media they provide a state of the art review of recent developments in the field including nonlinear optical and magneto optical properties Raman and hyper Raman scattering laser action plasmon excitation and localized giant fields imaging and spectroscopy of random media      **Glass Nanocomposites** Basudeb Karmakar, Klaus Rademann, Andrey Stepanov, 2016-01-19 Glass Nanocomposites Synthesis Properties and Applications provides the latest information on a rapidly growing field of specialized materials bringing light to new research findings that include a growing number of technologies and applications With this growth a new need for deep understanding of the synthesis methods composite structure processing and application of glass nanocomposites has emerged In the book world renowned experts in the field Professors Karmakar Rademann and Stepanov fill the knowledge gap building a bridge between the areas of nanoscience photonics and glass technology The book covers the fundamentals synthesis processing material properties structure property correlation interpretation thereof characterization and a wide range of applications of glass nanocomposites in many different devices and branches of technology Recent developments and future directions of all types of glass nanocomposites such as metal glasses e g metal nanowire composites nanoglass mesoporous silica composites semiconductor glass and ceramic glass nanocomposites as well as oxide and non oxide glasses are also covered in great depth Each chapter is logically structured in order to increase coherence with each including question sets as exercises for a deeper understanding of the text Provides comprehensive and up to date knowledge and literature review for both the oxide and non oxide glass nanocomposites i e practically all types of glass nanocomposites Reviews a wide range of synthesis types properties characterization and applications of diverse types of glass nanocomposites Presents future directions of glass nanocomposites for researchers and engineers as well as question sets for use in university courses      The Physics of Thin Film Optical Spectra Olaf Stenzel, 2015-09-22 The book bridges the gap between fundamental physics courses such as optics electrodynamics quantum mechanics and solid state physics and highly specialized literature on the spectroscopy design and application of optical thin film coatings Basic knowledge from the above mentioned courses is therefore presumed Starting from fundamental physics the book enables the reader derive the theory of optical coatings and to apply it to practically important spectroscopic problems Both classical and semiclassical approaches are included Examples describe the full range of classical optical coatings in various spectral regions as well as highly specialized new topics such as rugate filters and resonant grating waveguide structures The second edition has been updated and extended with respect to probing matter in different spectral regions homogenous and inhomogeneous line broadening mechanisms and the Fresnel formula for the effect of planar interfaces      **Optical Nanotechnologies** Junji Tominaga, 2003-06-13 This book treats the phenomena and techniques of advanced optics confined in nanometer scale regions especially near field optics and surface as well as local

plasmons Written by internationally distinguished scientists the coverage extends from the basics to the most advanced technologies system characteristics and methods of manipulation

**Electrodynamics Of Metamaterials** Andrey K Sarychev,Vladimir M Shalaev,2007-10-18 Light is in a sense one handed when interacting with atoms of conventional materials This is because out of the two field components of light electric and magnetic only the electric hand efficiently probes the atoms of a material whereas the magnetic component remains relatively unused because the interaction of atoms with the magnetic field component of light is normally weak Metamaterials i e artificial materials with rationally designed properties can enable the coupling of both of the field components of light to meta atoms enabling entirely new optical properties and exciting applications with such two handed light Among the fascinating properties is a negative refractive index The refractive index is one of the most fundamental characteristics of light propagation in materials Metamaterials with negative refraction may lead to the development of a superlens capable of imaging objects and their fine structures that are much smaller than the wavelength of light Other exciting applications of metamaterials include novel antennae with superior properties optical nano lithography and nano circuits and meta coatings that can make objects invisible The word meta means beyond in Greek and in this sense the name metamaterials refers to beyond conventional materials Metamaterials are typically man made and have properties not available in nature What is so magical about this simple merging of meta and materials that has attracted so much attention from researchers and has resulted in exponential growth in the number of publications in this area The answer you can find in this book

**Nanophysics, Nanophotonics, Surface Studies, and Applications** Olena Fesenko,Leonid Yatsenko,2016-08-10 This book presents some of the latest achievements in nanotechnology and nanomaterials from leading researchers in Ukraine Europe and beyond It features contributions from participants in the 3rd International Science and Practice Conference Nanotechnology and Nanomaterials NANO2015 held in Lviv Ukraine on August 26 30 2015 The International Conference was organized jointly by the Institute of Physics of the National Academy of Sciences of Ukraine University of Tartu Estonia Ivan Franko National University of Lviv Ukraine University of Turin Italy Pierre and Marie Curie University France and European Profiles A E Greece Internationally recognized experts from a wide range of universities and research institutions share their knowledge and key results on topics ranging from nanooptics nanoplasmonics and interface studies to energy storage and biomedical applications

Nanomaterials for Magnetic and Optical Hyperthermia Applications Raluca Maria Fratila,Jesús Martínez De La Fuente,2018-11-30 Nanomaterials for Magnetic and Optical Hyperthermia Applications focuses on the design fabrication and characterization of nanomaterials magnetic gold and hybrid magnetic gold nanoparticles for in vitro and in vivo hyperthermia applications both as standalone and adjuvant therapy in combination with chemotherapy The book explores the potential for more effective cancer therapy solutions through the synergistic use of nanostructured materials as magnetic and optical hyperthermia agents and targeted drug delivery vehicles while also discussing the challenges related to their toxicity

regulatory and translational aspects In particular the book focuses on the design synthesis biofunctionalization and characterization of nanomaterials employed for magnetic and optical hyperthermia This book will be an important reference resource for scientists working in the areas of biomaterials and biomedicine seeking to learn about the potential of nanomaterials to provide hyperthermia solutions Explores the design of efficient nanomaterials for hyperthermia applications allowing readers to make informed materials selection decisions Discusses the biofunctionalization of a range of nanomaterials and their interaction with living systems Provides an overview of the current clinical applications of nanomaterials in hyperthermia treatment

*Physics, Chemistry and Application of Nanostructures* Viktor Evgen'evich Borisenko, 2009 The book presents invited reviews and original short notes with recent results obtained in fabrication study and application of nanostructures which are promising for new generations of electronic and optoelectronic devices Recent developments in nanotechnology nanoelectronics spintronics nanophotonics nanosensorics and nanobiology are presented

*Physics, Chemistry And Application Of Nanostructures: Reviews And Short Notes - Proceedings Of The International Conference On Nanomeeting 2009* Victor E Borisenko, Sergei Vasil'evich Gaponenko, Valerij S Gurin, 2009-04-24 The book presents invited reviews and original short notes with recent results obtained in fabrication study and application of nanostructures which are promising for new generations of electronic and optoelectronic devices Recent developments in nanotechnology nanoelectronics spintronics nanophotonics nanosensorics and nanobiology are presented

*Plasmonics: Theory and Applications* Tigran V. Shahbazyan, Mark I. Stockman, 2014-01-09 This contributed volume summarizes recent theoretical developments in plasmonics and its applications in physics chemistry materials science engineering and medicine It focuses on recent advances in several major areas of plasmonics including plasmon enhanced spectroscopies light scattering many body effects nonlinear optics and ultrafast dynamics The theoretical and computational methods used in these investigations include electromagnetic calculations density functional theory calculations and nonequilibrium electron dynamics calculations The book presents a comprehensive overview of these methods as well as their applications to various current problems of interest

[Ferroelectric Thin Films](#) Masanori Okuyama, Yoshihiro Ishibashi, 2005-02-22 Ferroelectric thin films continue to attract much attention due to their developing applications in memory devices FeRAM infrared sensors piezoelectric sensors and actuators This book aimed at students researchers and developers gives detailed information about the basic properties of these materials and the associated device physics The contributing authors are acknowledged experts in the field

**Advances in Nanomaterials and Nanostructures** Kathy Lu, Navin Jose Manjooran, Miladin Radovic, Gary Pickrell, Eugene Medvedovski, Eugene A. Olevsky, Chris Li, Gurpreet Singh, Nitin Chopra, 2011-10-05 This book contains 17 papers from the Controlled Processing of Nanoparticle based Materials and Nanostructured Films Nanotechnology for Energy Healthcare and Industry and Nanolaminated Ternary Carbides and Nitrides MAX Phases symposia held during the 2010 Materials Science and Technology MS Low Dimension Nanomaterials Processing and Sintering Thin Films

Nanolaminated Ternary Carbides and Nitrides MAX Phases and Novel Nanomaterial Approaches      **Few-Cycle Laser Pulse Generation and Its Applications** Franz X. Kärtner, 2004-09-14 This book covers the physics technology and applications of short pulse laser sources that generate pulses with durations of only a few optical cycles The basic design considerations for the different systems such as lasers parametric amplifiers and external compression techniques which have emerged over the last decade are discussed to give researchers and graduate students a thorough introduction to this field The existence of these sources has opened many new fields of research that were not possible before These are UV and EUV generation from table top systems using high harmonic generation frequency metrology enabling optical frequency counting high resolution optical coherence tomography strong field ultrafast solid state processes and ultrafast spectroscopy to mention only a few Many new applications will follow The book attempts to give a comprehensive while not excessive introduction to this exciting new field that serves both experienced researchers and graduate students entering the field The first half of the book covers the current physical principles processes and design guidelines to generate pulses in the optical range comprising only a few cycles of light Such as the generation of relatively low energy pulses at high repetition rates directly from the laser parametric generation of medium energy pulses and high energy pulses at low repetition rates using external compression in hollow fibers The applications cover the revolution in frequency metrology and high resolution laser spectroscopy to electric field synthesis in the optical range as well as the emerging field of high harmonic generation and attosecond science high resolution optical imaging and novel ultrafast dynamics in semiconductors These fields benefit from the strong electric fields accompanying these pulses in solids and gases during events comprising only a few cycles of light

**Femtosecond Technology for Technical and Medical Applications** Friedrich Dausinger, Friedemann Lichtner, Holger Lubatschowski, 2004-10-14 A comprehensive overview of the principles and applications of femtosecond lasers especially applied to medicine and to production technology The advantages and problems of ultrashort laser pulses are discussed in more detail in the context of applications in the micro machining of technical materials such as drilling surface structuring and cutting in medical use like dental ophthalmologic neurological and otolaryngological applications in metrology and in the generation of x rays Safety aspects are also considered      Physics, Chemistry and Application of Nanostructures V. E.

Borisenko, V. S. Gurin, Sergey V. Gaponenko, 2007 This proceedings volume presents invited reviews and original short notes of recent results obtained in studies concerning the fabrication and application of nanostructures which hold great promise for the new generation of electronic and optoelectronic devices Governing exciting and relatively new topics such as fast progressing nanoelectronics and optoelectronics molecular electronics and spintronics as well as nanotechnology and quantum processing of information this book gives readers a more complete understanding of the practical uses of nanotechnology and nanostructures      **Light Scattering and Nanoscale Surface Roughness** Alexei A.

Maradudin, 2010-05-10 All real surfaces both those occurring naturally and those fabricated artificially and with great care

are rough to some degree. It is therefore of interest and often of importance to know the extent to which this roughness affects physical processes occurring at a surface. A particularly interesting class of physical processes occurring at a rough surface is the scattering of electromagnetic waves from it or their transmission through it. In this case the degree of the surface roughness is referred to the wavelength of the waves incident on it. The study of the scattering of electromagnetic waves from rough surfaces has been actively carried out for more than a century now since Rayleigh's investigations of the scattering of a monochromatic plane wave incident normally on a sinusoidal interface between two different media. The first theoretical treatment of the scattering of an electromagnetic wave from a randomly rough surface was due to Mandel'shtam in the context of the scattering of light from a liquid's face. In these pioneering studies the angular dependence of the intensity of the scattered field was calculated by perturbation theory as an expansion in powers of the surface profile function though the first nonzero term is a single scattering approximation.

Surface-Enhanced Raman Scattering Katrin Kneipp, Martin Moskovits, Harald Kneipp, 2006-06-21 Almost 30 years after the first reports on surface enhanced Raman signals the phenomenon of surface enhanced Raman scattering (SERS) is now well established. Yet explaining the enhancement of a spectroscopic signal by fourteen orders of magnitude continues to attract the attention of physicists and chemists alike. And at the same time and rapidly growing SERS is becoming a very useful spectroscopic tool with exciting applications in many fields. SERS gained particular interest after single molecule Raman spectroscopy had been demonstrated. This book summarizes and discusses present theoretical approaches that explain the phenomenon of SERS and reports on new and exciting experiments and applications of the fascinating spectroscopic effect.

*Solid-State Mid-Infrared Laser Sources* Irina T. Sorokina, Konstantin L. Vodopyanov, 2003-09-04 This collection of authoritative reviews by leading experts provides a broad and instructive introduction to the most advanced techniques for generating coherent light in the mid infrared region of the spectrum. With a wealth of up to date references also available online.

*Vortex Electronics and SQUIDs* Takeshi Kobayashi, Hisao Hayakawa, Masayoshi Tonouchi, 2003-12-08 Understanding the nature of vortices in high  $T_c$  superconductors is a crucial subject for research on superconductive electronics especially for superconducting interference devices (SQUIDs). It is also a fundamental problem in condensed matter physics. Recent technological progress in methods for both direct and indirect observation of vortices e.g. scanning SQUID terahertz imaging and microwave excitation has led to new insights into vortex physics: the dynamic behavior of vortices in junctions and related questions of noise. This book presents the current status of research activity and provides new information on the applications of SQUIDs including magnetocardiography, immunoassays and laser SQUID microscopes, all of which are close to being commercially available.

*Cryogenic Particle Detection* Hans-Christian Stahl, 2005-06-22 The development of cryogenic devices for particle detection has reached a stage at which many interesting applications are conceivable and already have been demonstrated. The book provides a comprehensive review of the field of cryogenic particle detection. It

introduces the different detection techniques and gives an overview of the important areas in which these detectors are successfully applied



## Reviewing **Optical Properties Of Nanostructured Random Media**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is really astonishing. Within the pages of "**Optical Properties Of Nanostructured Random Media**," an enthralling opus penned by a very acclaimed wordsmith, readers embark on an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve into the book's central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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