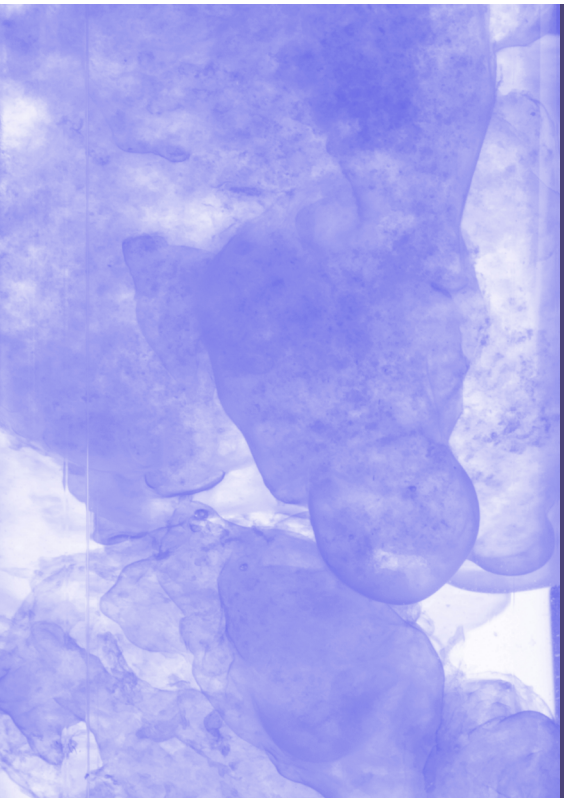
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Selected Papers



Recent Advances in Bio-Based Wood Protective Systems: A Comprehensive Review

Authors: Massimo Calovi, Alessia Zanardi and Stefano Rossi

Abstract: This review emphasizes the recent ongoing shift in the wood coating industry towards bio-based resources and circular economy principles, promoting eco-friendly alternatives. In addressing wood's vulnerabilities, this study investigates the use of natural compounds and biopolymers to enhance wood coatings. These materials contribute to protective matrices that safeguard wood surfaces against diverse challenges. Essential oils, vegetable oils, and bio-based polymers are explored for their potential in crafting eco-friendly and durable coating matrices. Furthermore, this review covers efforts to counter weathering and biological decay through the application of various natural compounds and extracts. It evaluates the effectiveness of different bio-based alternatives to traditional chemical preservatives and highlights promising candidates. This review also delves into the incorporation of sustainable pigments and dyes into wood coatings to enhance both protective and aesthetic qualities. Innovative pigments are able to provide visually appealing solutions in line with sustainability principles. As the wood coating industry embraces bio-based resources and the circular economy, researchers are actively developing protective solutions that encompass the coating matrix, preservatives, bio-based fillers, and natural-pigment dyes....

https://doi.org/10.3390/app14020736



Application of Areal Topography Parameters in Surface Characterization

Authors: Vesna Alar, Andrej Razumić, Biserka Runje, Ivan Stojanović, Marin Kurtela and Branko Štrbac

Abstract: This review paper provides a comprehensive overview of selected 3D surface texture parameters defined by ISO 25178-2, with a focus on their metrological aspects in high-resolution measurements using atomic force microscopy (AFM). The parameters *Sa*, *Sz*, *Sq*, *Sdq*, and *Sdr* are analyzed in terms of their practical application, sensitivity to measurement conditions, and role in assessing surface functionality. Through a review of the literature and simulations of surface profiles with controlled geometric variations, the study demonstrates how the selected parameters respond to changes in step pitch, step width, slope, and lateral calibration errors. Experimental AFM measurements performed on a certified step height standard further illustrate the impact of calibration on the quality of measurement results. Special emphasis is placed on the importance of evaluating measurement uncertainty. The results confirm the need for rigorous instrument calibration and uncertainty assessment to ensure reliable and comparable surface characterization across different instruments and laboratories.

https://doi.org/10.3390/app15126573

Theoretical Aspects of Thin Film Optical Spectra: Underlying Models, Model Restrictions and Inadequacies, Algorithms, and Challenges

Authors: Olaf Stenzel and Steffen Wilbrandt

Abstract: Any calculation of thin film optical spectra requires the formulation of certain model assumptions. In general, those model assumptions concern geometrical features as well as material properties. We review important facets of the thin film optics' "standard model" that provides the basis of generally accepted relevant modern spectra calculation routines. Moreover, we discuss phenomena arising when certain model assumptions are violated. Examples are provided by the Goos–Hänchen shift, the polarization leakage, interaction with partially coherent light, rough surfaces, as well as the emergence of thickness-dependent, time-dependent, or non-linear optical material parameters. Corresponding challenges in coating characterization and design are discussed, and future prospects are identified.

https://doi.org/10.3390/app15042187

Hybrid Colloids Made with Polymers

Author: Camillo La Mesa

Abstract: Polymers adsorb onto nanoparticles, *NP*s, by different mechanisms. Thus, they reduce coagulation, avoid undesired phase separation or clustering, and give rise to hybrid colloids. These find uses in many applications. In cases of noncovalent interactions, polymers adsorb onto nanoparticles, which protrude from their surface; the polymer in excess remains in the medium. In covalent mode, conversely, polymers form permanent links with functional groups facing outward from the *NP*s' surface. Polymers in contact with the solvent minimize attractive interactions among the *NP*s. Many contributions stabilize such adducts: the *NP*–polymer, polymer–polymer, and polymer–solvent interaction modes are the most relevant. Changes in the degrees of freedom of surface-bound polymer portions control the stability of the adducts they form with *NP*s. Wrapped, free, and protruding polymer parts favor depletion and control the adducts' properties if surface adsorption is undesired. The binding of surfactants onto *NP*s takes place too, but their stabilizing effect is much less effective than the one due to polymers. The underlying reason for this is that surfactants easily adsorb onto surfaces, but they desorb if the resulting adducts are not properly stabilized. Polymers interact with surfactants, both when the latter are in molecular or associated forms. The interactions occur between polymers and ionic surfactants or amphiphiles associated with vesicular entities. Hybrids obtained in these ways differ each from each other....

https://doi.org/10.3390/app14125135

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Topical Collection

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Collection Editor: Dr. Ioannis Kartsonakis

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