STMP at 10: shaping surface metrology, measurement and phenomena for a decade

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Abstract

Surface Topography: Metrology and Properties (STMP) is reaching its 10th Birthday soon and this paper looks at the inception of the journal and the goals set in the mid 2010s and will look back at what it has published in the most highly cited areas and detail future initiatives to serve the readership. STMP publishes the latest physics, chemistry, life science, materials science and engineering research on applied, functional surfaces. It has published ground-breaking work on surface design, measurement, instrumentation, manufacturing, functionality and modelling as well as cross-disciplinary work on surface and interface engineering across an array of different applications. It is the home of papers from the biannual international conference on Metrology and Properties of Surfaces series. The journal was awarded it's first impact factor in 2017 and has a current value of 2.038 (2020) and is now working to improve on this. A new initiative for 2021 is to offer a collection of papers from emerging leaders within the scope of the journal.

Keywords: Surface, topography, metrology, properties, functionality, instrumentation, measurement, analysis, modelling, interfaces, corrosion, surface engineering, coatings, lubrication, wear

1. STMP Scope, History and Impact

Surface Topography: Metrology and Properties (STMP) journal focuses on surfaces and their performance including characterisation, measurement, manufacture and standards. The journal also covers how surfaces control interface performance and add multi-functionality and publishes the latest physics, chemistry, materials science and engineering research on applied, functional surfaces. As STMP approaches a decade of publishing papers in these areas it is useful to look at what papers have been most cited and downloaded to show the subjects of interest to readers and where seminal work has occurred. STMP was first published in 2013 and its scope and drivers are detailed by its first editor in chief, Professor Richard Leach [1]. In his editorial he states 'The subject area has never been more active and we are seeing genuine break throughs in the use of surfaces to control functional performance. Most manufactured parts rely on some form of control of their surface characteristics. The surface is usually defined as that feature on a component or device, which interacts with either the environment in which it is housed (or in which the device operates), or with another surface. The surface topography and material characteristics of a part can affect how fluids interact with it, how the part looks and feels and how two bearing parts will slide together. The need to control, and hence measure, surface features is becoming increasingly important as we move into a miniaturized world. Surface features can become the dominant functional features of a part and may become large in comparison to the overall size of an object. Research into surface texture measurement and characterization has been carried out for over a century and is now more active than ever, especially as new areal surface texture specification standards begin to be introduced. The range of disciplines for which the function of a surface relates to its topography is very diverse; from metal sheet manufacturing to art restoration, from plastic electronics to forensics. Until now, there has been no obvious publishing venue to bring together all these applications with the underlying research and theory, or to unite those working in academia with engineering and industry. STMP will publish the best work being done across this broad discipline in one journal, helping researchers to share common themes and highlighting and promoting the extraordinary benefits this field yields across an array of applications in the modern world'.

In the second editorial, Robert Wood added that recent interests cover biomimetic surface textures for anti-fouling [2], descaling and low drag [3] through to aerodynamically efficient surfaces for turbine blades and aircraft fuselage skins [4]. All of these applications present challenges for surface design, measurement and manufacture including scale-up. STMP has grown in size and in readership and has developed an excellent reputation for its dedicated service to the international surface topography community. Boosted by this continued growth, we were delighted to broaden the journal's scope. STMP also now publishes cross-disciplinary work on surface and interface engineering, helping researchers to share common themes on surface properties across an array of different applications. The journal also aims to publish high quality research in ground breaking areas where surfaces are key to the success of understanding performance whether in engineering, biomedics, space, archaeology, geology or geography domain.

STMP has published a wide range of special issues on subjects including tribology, additive manufacturing and surface topography in palaeontology [5], green tribology [6], tribology of living tissue, biosurfaces and quality of life [7], surface texturing by design [8], carbon-based solutions to improve friction and wear performance [9], advanced manufacturing [10, 11], marine materials [12]and surface metrology [13]. Special issues of selected papers from the International Conference on Metrology and Properties have been regularly published. It has invited several seminal reviews on topics within its scope. The STMP Board represents the journal's readership and global research groups.

Strong and authoritative reviews published in STMP have helped to shape the state-of-the-art on different surface-governed phenomena, topography measurement and surface engineering. The top 5 downloaded reviews of the 24 reviews published to date cover the measurement of dental microwear textures to inform the diets of mammals (8969 downloads to 13/12/21) [14], topography measurements and tool mark identifications for forensic examinations in ballistics (7588 downloads to 13/12/21) [15], quantitative assessment of surface topography using spectral analysis (5708 downloads to 13/12/21) [16], optical wafer metrology (4935 downloads to 13/12/21) [17] and a roadmap for surface topography (4014 downloads to 13/12/21) [18].

The most recent reviews at time of publishing are:

1. Hemanth, Suresha and Ananthapadmanabha [19] provided a cumulative insight into the tribology and surface topography of engine components in electric and hybrid electric vehicles, identifying research gaps in key areas such as design, materials, power harness, and lubrication techniques; 2. Wood and Lu [20] reviewed the relationships between the surface topography of the edges of blades used in turbomachinery and their performance, focusing on form and topography changes induced during service, as well as repair and protection strategies; 3. Grützmacher, Jalikop, Gachot and Rosenkranz [21] summarized the physics behind thermocapillary migration and how it is affected by surface texturing and chemical modification. Applications varying from microfluidics to inkjet printing to high-speed bearings were identified, but also the current challenges and needed research; 4. Sharma, Verma, Sharma and Kango [22] overlooked experimental, analytical and numerical works on the effects of surface texturing and different coatings on the performance of inclined and journal bearings; 5. Lu and Wood [23] reviewed applications of surface texturing in different mechanical systems (cutting tools, piston-ring & cylinder liners, sealing and journal bearings); and 6. Padhan, Marathe and Bijwe [24] presented an overview of the wear mechanisms and transfer films involved in the relative motion of fiber-reinforced polymer composites, focusing on adhesive wear and abrasive wear.

The remaining reviews focused on inspiration and design of functional surfaces for tribological applications [25]; the importance of surfaces and interfaces in clays for water remediation processes [26]; surfaces and perception engineering [27]; ISO 25178-70 material measures with direct laser writing [28]; surface properties of biodegrading magnesium and its alloys [29]; quantification of bone weathering stages using roughness measurements [30]; gecko-inspired dry adhesive surfaces [31]; green tribology [32]; characterization of tessellated surfaces [33]; data fusion techniques in surface metrology [34]; road surface texture and skid resistance [35]; textured piston rings/liners [36]; scatterometry [37]; surface analysis of stone and bone tools [38]; surface nanohardness of enamel [39]; and surface texture measurement for dental wear [40].

The top 14 papers by citation (according to Web of Science, December 2021) show clusters under five topics: (i) dental, (ii) roughness analysis, (iii) additive manufacturing,

(iv) surface texturing, (v) instrumentation and (vi) semiconductors. The main points addressed in each cluster are summarized.

i. Dental field

The application of surface metrology and characterization has evolved very rapidly as a fundamental route to understand and/or optimize the biological, tribological, optical, and aesthetic performance of natural and biomimetic dental materials. This has been reflected in the large number of papers related to the dental field in STMP. With 68 citations to date, DeSantis [14] looked into the analysis of dental microwear textures to reveal dietary information in a broad range of herbivorous, omnivorous, and carnivorous mammals by characterizing microscopic tooth surfaces in three-dimensions, without the counting of individual surface features. Hence, she was able to reconstruct diets in a broad array of living and extinct mammals. Other papers looking at how tooth wear and topography yield information on diet of the animal can be found in the following papers. Confocal laser scanning microscopy and texture analysis techniques were applied to identify use-wear patterns on experimental and archaeological bone artifacts [41]. Enamel surface topography analysis for diet discrimination and a methodology to enhance and select discriminative parameters is given in [42]. Troubleshooting the study of dietary niche space overlap between North American stem primates and rodents is explored in [43]. A set of hypotheses on tribology of mammalian herbivore teeth are detailed in [44]. Schmidt, Beach, McKinley and Eng [45] looked at distinguishing dietary indicators of pastoralists and agriculturists via dental microwear texture analysis. Minimizing inter-microscope variability in dental microwear texture analysis is detailed in [46]. Finally, 3D tooth microwear texture analysis in fishes as a test of dietary hypotheses of durophagy can be found in [47].

Many papers have addressed issues related to dental metrology. A process is outlined that offers a solution for allowing comparison of data between microscopes, which is essential for ongoing dental microwear texture analysis (DMTA) research. In addition, the process undertaken, including considerations of other elements of DMTA protocols also promises to streamline methodology, remove measurement noise and in doing so, optimize recovery of a reliable dietary signature [48]. Erickson, Sidebottom, Curry, Kay, Kuhn-Hendricks, Norell, Sawyer and Krick [49] looked at paleo-tribology and the development of wear measurement techniques and a three-dimensional model revealing how grinding dentitions self-wear to enable functionality. A surface form analysis on complex freeform organic structures to measure erosive wear on human teeth in vitro is summarised in [50]. A review on surface nanohardness of enamel and erosion of teeth is detailed in [39] while applicability of characterization techniques on fine scale surfaces are given in [51]. Finally, surface texture measurement for dental wear applications is covered by [40].

Dental implant materials are covered by 5 papers. Surface characteristics of dental resin nanoceramic in vitro finished by dental handpieces and rotary burs are researched in [52] . Development of a novel method to characterize mean surface peak curvature as a signature of tribological performance of dental implant can be found in [53]. On a related topic, the quantification of dental implant surface wear and topographical modification generated during insertion is covered in [54]. The mechanical properties and tribological behaviours of yttria-zirconia ceramics and micro-abrasion wear of novel biomedical PEEK-matrix composites for restorative dentistry are covered in [55] and [56], respectively.

ii. Roughness analysis

Jacobs, Junge and Pastewka [57] summarise how to analyse topography measurements to reconstruct a reliable power spectral density (PSD). Analytical models demonstrate the potential for tuning functional properties by rationally tailoring surface topography—however, this potential can only be achieved through the accurate, quantitative reconstruction of the PSDs of real-world surfaces. In their paper, Wang, Leach and Jiang [34] look at using data from different sensors and the process of data fusion. They review current data fusion methods and applications, with a focus on the mathematical foundations of the subject. Common research questions in the fusion of surface metrology data are raised and potential fusion algorithms are discussed.

In their paper, Stemp, Morozov and Key [58] explore the role that applied force or working load plays in wear formation and the ability to discriminate worn stone tool surfaces mathematically as loading conditions change and the differences in working load on two stone tools decrease. They report on using a laser scanning confocal microscope to mathematically document the surface texture of basalt flakes. The worn surface data were compared using area-scale fractal complexity (Asfc), calculated from relative areas, to determine the degree to which variation in loading significantly affected the amount of wear on the flake surfaces. Their results indicate that working load does play a role in the development of lithic microwear on these flakes and that discrimination of two worn flake surfaces, using mean square ratios of Asfc based on variable load is consistently possible.

The papers that look at surface roughness measurements associated with tribology are [54, 59-73]. The forensic topic concerning identification of ballistics and gun cartridge use is covered in [15, 74]. The comparison of two metrological approaches for the prediction of human haptic perception is covered in [75]. Quantifying leaf surface roughness using a 3D optical surface profiler is reported by [76]. The assessment of the discriminating power of roughness parameters using a roughness databank is explored in [77]. A multi-topographical-instrument analysis of breast implant texture is shown in [78]. The topography characterization of polycrystalline diamond coatings is examined in [79]; for indium tin oxide (ITO) thin films in [80]; and for the structure and properties of pulse electrodeposited Cr-WC coating in [81]. The relation between fractal signature and topography parameters is given in [67] while [82] presents a comparison of three multiscale methods for topographic analyses. Applicability of characterization techniques on fine scale surfaces is reviewed in [83] while the characterization of surface topography using 3D stereoscopic reconstruction of SEM images is given in [84]. Confocal laser scanning microscopy and texture analysis techniques were applied to identify use-wear patterns on experimental and archaeological bone artifacts in [41]. Roughness measurements elated to manufacturing are given in a suite of papers [85-102].

iii. Additive manufacturing

The topic of additive manufacturing (AM) has received a large number of contributions to STMP since the quality of the surface is still one of the main sources of concern for the manufactured parts. The STMP special issue of additive manufacture published 11 papers. The editorial [11] suggests that steps are being taken to link process parameters and their effect on surface properties [86, 103, 104]. Also being considered is how processing influences the mechanical properties of components, as a result of both the morphology of the outer surface [105, 106], and surface introduced at internal defects [107]. There is also the question of how best to characterise the surfaces produced by AM. Some evaluations are given in [108-110]. There are also two papers that look at AM as an enabling technology, reporting on the surfaces prepared with additional post-fabrication finishing in the shape of subtractive [111] and additive [112] processes.

Outside the special issue, other important contributions deserve attention. Bochmann, Bayley, Helu, Transchel, Wegener and Dornfeld [113] determined the sources of imprecision in fused deposition modelling (FDM) to allow improvements in the design and control of FDM technology. Process errors in terms of surface quality, accuracy and precision were identified and quantified, and an error-budget approach was used to characterize errors of the machine tool. It was determined that accuracy and precision in the *y* direction are generally greater than in the *x* direction and the *z* direction.

Topography measurement of parts produced by additive manufacturing has been another current hot topic. The use of a confocal microscope and three-dimensional surface parameters has been proposed to assess the topography of parts produced by laser sintering and laser beam melting, showing advantages over tactile profilometry with conventional two-dimensional surface parameters [114]. Jamshidinia and Kovacevic [115] measured the surface roughness of as-built thin plates using a two-axis profilometer, proposing a numerical model to analyse the relationship between spacing distance and heat accumulation. Their experimental data allowed to establish a logarithmic regression equation that could be used to predict the surface roughness of parts fabricated by electron beam melting. New horizons in the surface roughness characterization of selective laser sintering are explored in [116], while [95] looks at surface-specific additive manufacturing test artefacts

The characterization, modelling and simulation of surfaces created by fused deposition is addressed in [117]. In situ 3D monitoring and control of geometric signatures in wire and arc additive manufacturing are looked at in [118]. Surface topography segmentation methods for feature-based characterisation of metal powder bed fusion surfaces are compared and validated in [119]. The material ratio curve of 3D surface topography of additively manufactured parts is used as an attempt to characterise open surface pores [120], while [121] seeks a prediction of Extreme Value Areal Parameters in Laser Powder Bed Fusion of the Nickel Superalloy 625. [83] and [122] look at using confocal fusion for measurement of metal AM surface texture and modelling of a thermal additive centrifugal abrasive flow machining process respectively. The surface-process correlation for an ink-jet printed transparent fluoroplastic is researched in [123].

Another very important aspect of additive manufacturing is the fatigue life of the components, since the surface is prone to present discontinuities. Chan [98] revealed that the fatigue lives of the additively manufactured plates with rough surface topographies and notch-like features are dominated by the fatigue crack growth of large cracks for both the laser beam melting and electron beam melting techniques. The fatigue strength reduction due to the surface notches was as large as 60%–75%. It was proposed that for better fatigue performance, the surface notches on these materials need to be removed by machining and the surface roughness be improved to a surface finish of about 1 μm.

iv. Surface texturing

Surface texturing has emerged as a successful technique to confer a variety of functionalities to surfaces via the control of surface topography. STMP has published more than a hundred manuscripts involving surface texturing. The use of surface textures has played a major role to improve lubrication [22, 68, 124-135], reduce wear [68, 126, 129, 131, 132, 136-143], control friction (increase or reduce) [36, 68, 124-127, 129, 132, 133, 135, 138, 139, 142, 143], control adhesion [35, 140, 141, 144-147], control wettability [127, 128, 146, 148-152], confer biofouling properties [153], improve tactile and visual perception [27, 154], increase heat transfer [21, 130], confer biocompatibility [52, 155], control optical properties [156-158], improve sealing performance [159-163], improve aerodynamics [142, 164-166], among others.

Analytical and numerical modelling has been a powerful tool to assist the design of surface textures. CFD simulation has been used to predict the performance of lubricated bearings. The ability to account for transient loads has enabled the calculation of dynamic coefficients [130]. For sealing applications, analytical modelling has been used to design apex seals used in Wankel engines [159]. A numerical model showed significant improvements in the static and dynamic performance of a foil air journal bearings for textures consisting of either dimples or grooves when compared with a conventional plain foil [165]. Similarly, for meso scale air journal bearings used in miniaturized systems, numerical modelling with an optimization algorithm found around 20% in friction reduction and 12% increase in load bearing capacity for the optimized texture pattern [166]. Cassie-Baxter wetting modelling has been used to design superomniphobic surfaces. The texture height was used as the capillary length was utilized to assess the relation between a curved liquid-air interface and the surface texture, finding that when the texture dimension was reduced from the micrometric scale to the nanometric scale the contact angle increased by 15%-20% [150].

Various surface texturing techniques have been explored. Laser texturing has been the most widely used [98, 125, 128, 132, 138, 146, 151, 153, 159, 160, 167-169], but other techniques include electrochemical texturing [68, 170], electrodischarge texturing [171-174], photochemical texturing [126, 137, 152, 175, 176], chemical etching [157], micro slurry-jet erosion [52, 148, 155], localized deformation [124, 128, 136], sintering [167], polymer molding [149], conventional machining [177], microcutting [124, 139], additive manufacturing [141], self-arranging [102], self-forming by wear [147], and printing [158].

Measurement of the topography of textured surfaces has been a major area for STMP. More than 30 manuscripts have focused solely on metrological aspects of textured surfaces, proposing new measuring procedures, new protocols for improving the extraction of the main texture´s features, and parameters for more meaningful quantification of the surface textures [33, 37, 40, 75, 78, 80, 82, 83, 92, 95, 101, 102, 109, 119, 120, 167, 170, 172, 178-193]. In the last decades, scatterometry has matured to be a fast, precise and accurate characterization technique [194]. It has evolved from measurements of simple grating parameters in the 1990s to today's in-line characterization of full wafers with sub-nm uncertainty. With more user-friendly scatterometers and software packages being developed, scatterometry is ready to be taken up by new industries such as injection molding and roll-to-roll companies [37].

A recent trend is the use of surface texturing metrology to train machine-learning algorithms aiming to optimize surface functionality, such as surface texturing for friction reduction [195]. Another growing area involves metrology of surface textures that are innate from additive manufacturing techniques.

A preliminary investigation was carried out on two additive manufacturing processes—selective laser melting (SLM) and electron beam melting (EBM)—focusing on the effect of build angle and post processing. The surfaces were measured using both tactile and optical methods and a range of profile and areal parameters were reported, as well as the effect caused by the layered nature of the manufacturing process [109]. Townsend, Racasan and Blunt [95] have proposed surface-specific measurement test artefacts designed additive manufacturing, including deviation analysis, generation of surface texture parameters, sub-surface analysis, layer step analysis and build resolution comparison. In order to identify open pores resulting from additive manufacturing, Lou, Zhu, Zeng, Majewski, Scott and Jiang [196] proposed the use of material ratio curves to quantify the surface texture. The use of confocal microscopy to quantify the surface texture in parts manufactured by additive manufacturing has also been investigated [83].

v. Instrumentation

Since surface metrology has been at the heart of STMP, modern instrumentation is one area with top-quality, state-of-the-art submissions. Lehmann, Tereschenko and Xie [197] discuss the influences restricting the resolution and precision in vertical scanning white light interferometry (SWLI). They demonstrated that in many relevant cases the axial measurement uncertainty in SWLI measurements based on phase evaluation is superior compared to phase-shifting interferometry. The lateral resolution in phase measuring interferometry is affected by the diffraction limit which leads to low-pass filtering effects in the profiles resulting from the phase modulation of the wave front reflected by the measuring object. On the other hand, the results of analyzing the amplitude modulation of SWLI signals, *i.e.* applying the envelope evaluation technique, seemed to show a better lateral resolution compared to phase evaluation. Finally, a practical method to get rid of phase jumps without manipulating the measured phase values was introduced and verified by experimental data. The work by Jäger, Manske, Hausotte, Müller and Balzer [198] details the development of a new nanopositioning and nanomeasuring machine NPMM-200 with a measuring range of 200 mm × 200 mm × 25 mm, and a resolution of 0.02 nm. The machine represents the great improvement of the extended three-dimensional Abbe comparator principle to achieve nanometre accuracy. All six degrees of freedom of the mirror plate with the measuring object are measured by fibre-coupled laser interferometers, the signals of which are then used together with the probe system signals for a high-precision position and orientation control and surface and coordinate measurements.

The use of the Burg algorithm for enhancing measurement performance in wavelength scanning interferometry is covered in [195] while a method for the characterization of the reflectance of anisotropic functional surfaces is given by [199]. Wave propagation as a marker of structural and topographic properties of human skin and multiple spatial-frequency fringes selection for absolute phase recovery are covered in [200] and [201] respectively. Quantitative calibration of conductive pattern growth via electroless copper plating at the nano-resolution scale is given in [202].

vi. Semiconductors

In the semiconductor industry, microfabrication and surface patterning techniques have been pushed close to its limits. Precise surface metrology is fundamental since small variations in the manufacturing process can significantly affect the performance of the components, making STMP a natural choice for ground-breaking papers in the area. den Boef [203] presents three optical wafer metrology sensors that are used in lithography for robustly measuring the shape and position of wafers and device patterns. The first two sensors are a level sensor and an alignment sensor that measure, respectively, a wafer height map and a wafer position before a new pattern is printed on the wafer. The third sensor is an optical scatterometer that measures critical dimension-variations and overlay after the resist has been exposed and developed. These sensors have different optical concepts but they share the same challenge that sub-nm precision is required at high throughput on a large variety of processed wafers and in the presence of unknown wafer processing variation. The paper explains these challenges in detail and gives an overview of the various solutions that have been introduced to come to process-robust optical wafer metrology.

The topic is further explored in Jäger, Manske, Hausotte, Müller and Balzer [198] by the optical dimensional metrology of deep sub-wavelength nanostructured surfaces and optical wafer metrology sensors for process-robust CD and overlay control in semiconductor device manufacturing in [204]. The use of scatterometry as a fast and robust measurement of nano-textured surfaces can be found in [37]. Finally, artificial intelligent matching for scratches of semiconductor wafers is explored in [205].

New/Innovative Journal Features

STMP has flourished within this decade, but it has not ceased to seek constant improvement. The journal presents new initiatives to improve the quality of the manuscripts, to increase its impact and significance, to encourage outstanding young researchers to publish in STMP and to promote equal opportunities.

Double anonymous reviewing

STMP has recently transitioned to double-anonymous (or double-blind), as part of IOP Publishing's dedication to tackle the significant gender, racial and geographical under-representation in the scholarly publishing process. Double-anonymous peer review, where the reviewer and author identities are concealed, has the potential to reduce bias with respect to gender, race, country of origin or affiliation which should lead to a more equitable system [206].

Emerging Leaders 2021

STMP is bringing together the best early-career researchers in surface topography, metrology and properties and will publish their exceptional work in an annual collection dedicated to 'Emerging leaders'. An emerging leader is defined as a top researcher in their field who completed their PhD in 2009 or later (10 years excluding career breaks). The Emerging Leaders articles are listed in Table 1. This initiative will be repeated in 2022, for researchers who completed their PhD in 2010 or later.

Regional special issues:

Regional special issues are a new initiative of STMP to celebrate regional strengths and innovations as well as to address regional drivers / applications. They are a great initiative to bring together established leaders and emerging scientific stars, helping to strengthen regional research communities and to define their profile and potential.

Currently, STMP has one regional special issue accepting manuscripts, called "Surface Engineering/Tribology in Latin America", guest edited by Prof. José Daniel Biasoli de

Mello and Prof. Henara Costa. This issue will celebrate the importance of the research carried out in recent years, highlighting the strongest Latin American contributions in surface modifications, coatings and tribology. Research regarding surface performance and characterization for applications ranging from friction, lubrication, wear, manufacturing, surface functionalization, surface chemistry, biomimetics, to biomedics are welcome.

New regional special issues can be proposed by regional leaders that are highly influential in their fields. To discuss that, applicants should contact the publisher and/or the editor-in-chief.

Why Publish in STMP

STMP is an international forum for academics, industrialists and engineers to publish the latest research in surface topography measurement and characterisation, instrumentation development and the properties of surfaces. The international editorial board is made up of experts across these areas and they have a wide range of application experience as well as a passion for the progression of surface science. The journal seeks to be the home to the latest breakthroughs in these areas of surface topography written by globally leading authors. The journal offers a very good range of special collections and offers best paper awards annually. STMP had a record year in 2020 (341 submissions, 115 accepts, 42,394 downloads) and is ahead at the same point this year on all metrics. Papers are accepted on average (median) within three calendar months from submission, and are available to read and cite within 24 hours as Accepted Manuscripts (https://iopscience.iop.org/journal/2051-672X/acceptedmanuscripts/10/1). Impact Factor is also going in the right direction 1.613 > 2.038.

List of Special Collection:

The current list of STMP special issues open as December 2021 is detailed in Table 2. The collections published up to December 2021 can be found in Table 3.

Table 1. List of articles by emerging leaders.

Title	Reference
Mathematical approach to the validation of form removal surface texture software	Luke Todhunter *et al* 2020 *Surf. Topogr.: Metrol. Prop.* **8** 045019 [207]
Material ratio curve of 3D surface topography of additively manufactured parts: an attempt to characterise open surface pores	S Lou *et al* 2021 *Surf. Topogr.: Metrol. Prop.* **9** 015029 [196]
Topography characterization of sinusoidal surfaces obtained with electrochemical machining	Julie Marteau *et al* 2021 *Surf. Topogr.: Metrol. Prop.* **9** 025002 [208]
Characterisation of freeform, structured surfaces in T-spline spaces and its applications	Jian Wang *et al* 2021 *Surf. Topogr.: Metrol. Prop.* **9** 025003 [209]
A closed-loop feature-based FTS patterning and characterisation of functional structured surfaces	Zhen Tong *et al* 2021 *Surf. Topogr.: Metrol. Prop.* **9** 025012 [210]
Surface form analysis on complex freeform organic structures – measuring erosive wear on human teeth in vitro	P Mylonas *et al* 2021 *Surf. Topogr.: Metrol. Prop.* **9** 025024 [50]
Tunable thickness and uniform drop deposition of graphene oxide on porous anodic aluminum oxide and a reliable thickness measurement technique	Hyeonho Cho *et al* 2021 *Surf. Topogr.: Metrol. Prop.* **9** 025026 [211]
Prediction of Extreme Value Areal Parameters in Laser Powder Bed Fusion of Nickel Superalloy 625	Jason C Fox and Adam L Pintar 2021 *Surf. Topogr.: Metrol. Prop.* **9** 025033 [212]
Internal surface roughness measurement of metal additively manufactured samples via x-ray CT: the influence of surrounding material thickness	Joseph John Lifton *et al* 2021 *Surf. Topogr.: Metrol. Prop.* **9** 035008 [213]

Table 2. List of open special issues.

Title	Guest editors
Artificial Intelligence Machine Learning Applied to Surface Topography and Pattern Recognition	Sasan Mahmoodi, Robert Wood and Michael Nosonovsky
Measuring Archaeological Surfaces: Methods and Challenges	Haris Procopiou, Roberto Vargiolu and Hassan Zahouani
Microscopy for Surfaces	Jian Liu Harbin and Xumin Ding
Surface and Interface Metrology in Semiconductor	T. Y. Lin, W. E. Fu and C-C. Arthur Chen

Manufacturing	
Biosurfaces and Quality of Life	Liam Blunt and Hassan Zahouani
Regional Special Issue: Surface Engineering and Tribology in Latin America	Henara L. Costa and José D. B. de Mello

Table 3. List of published collections

Title	Editors	Description
Surface Texturing by Design	Robert Wood and Henara L. Costa	3 reviews, 7 papers + editorial
Innovative Carbon-Based Approaches to Tailor Friction and Wear Performance	Andreas Rosenkranz and Sebastian Suarez	5 papers
Advanced Manufacturing for Factory of the Future	Mohamed El-Mansori	4 papers
Surface and Interface of Marine Materials	Liping Wang, Wenjie Zhao and Haichao Zhao	24 papers + editorial
Selected Papers from Met and Props 2019	Hassan Zahouani	1 review, 14 papers
Selected Papers from Met and Props 2017	B.G. Rosén	19 papers
In-situ Measurement	Tom Reddyhoff	5 papers
Surfaces for Water-Related Applications	Michael Nosonovsky	1 review, 5 papers + editorial
Green tribology	R K Pandey, Robert Wood and Jayashree Bijwe	1 review, 7 papers + editorial
Tribology in multi-scale manufacturing	Mohamed El-Mansori	1 review, 7 papers + editorial
Surfaces and interfaces in bioengineering systems	Michael Bryant and Peter Culmer	7 papers + editorial
Exposing the past	Peter S Ungar and Adrian A Evans	2 reviews, 10 papers + editorial
Optical surface metrology in the context of enhanced resolution and precision	Wolfgang Osten and Jörg Seewig	1 review, 11 papers + editorial
Additive manufacturing	Christopher Tuck and Liam Blunt	11 papers + editorial

References

[1] Leach R 2013 Welcome to Surface Topography: Metrology and Properties *Surface Topography: Metrology and Properties* **1** 010201

[2] Nosonovsky M 2019 Surfaces for water-related applications *Surface Topography: Metrology and Properties* **7** 010201

[3] Geraldi N R, Dodd L E, Xu B B, Wells G G, Wood D, Newton M I and McHale G 2017 Drag reduction properties of superhydrophobic mesh pipes *Surface Topography: Metrology and Properties* **5** 034001

[4] Wood R J K 2016 Announcement from the new Editor-in-Chief of STMP 2016 *Surface Topography: Metrology and Properties* **4** 010401

[5] Ungar P S and Evans A 2016 Exposing the past: surface topography and texture of paleontological and archeological remains *Surface Topography: Metrology and Properties* **4** 040302

[6] Pandey R K, Wood R J K and Bijwe J 2017 Green tribology *Surface Topography: Metrology and Properties* **5** 010302

[7] Bryant M and Culmer P 2016 Surfaces and interfaces in bioengineering systems *Surface Topography: Metrology and Properties* **4** 040303

[8] Wood R and Costa H 2021 Editorial: surface texturing by design *Surface Topography: Metrology and Properties* **9** 040201

[9] Rosenkranz A and Suarez S 2021 Innovative carbon-based approaches to tailor friction and wear performance—Editorial *Surface Topography: Metrology and Properties* **9** 040202

[10] El Mansori M 2017 Special issue collection on tribology in multi-scale manufacturing *Surface Topography: Metrology and Properties* **5** 010301

[11] Tuck C and Blunt L 2016 Special issue collection on additive manufacturing (AM) *Surface Topography: Metrology and Properties* **4** 020201

[12] Wang L, Zhao W and Zhao H 2020 Surface and Interface of Marine Materials *Surface Topography: Metrology and Properties* **8** 010401

[13] Osten W and Seewig J 2016 Special issue on optical surface metrology in the context of enhanced resolution and precision *Surface Topography: Metrology and Properties* **4** 040301

[14] DeSantis L R G 2016 Dental microwear textures: reconstructing diets of fossil mammals *Surface Topography: Metrology and Properties* **4** 023002

[15] Vorburger T V, Song J and Petraco N 2016 Topography measurements and applications in ballistics and tool mark identifications *Surface Topography-Metrology and Properties* **4**

[16] Jacobs T D B, Junge T and Pastewka L 2017 Quantitative characterization of surface topography using spectral analysis *Surface Topography-Metrology and Properties* **5**
[17] den Boef A J 2016 Optical wafer metrology sensors for process-robust CD and overlay control in semiconductor device manufacturing *Surface Topography-Metrology and Properties* **4**
[18] Leach R, Evans C, He L Y, Davies A, Duparre A, Henning A, Jones C W and O'Connor D 2015 Open questions in surface topography measurement: a roadmap *Surface Topography-Metrology and Properties* **3**
[19] Hemanth G, Suresha B and Ananthapadmanabha 2021 Hybrid and electric vehicle tribology: a review *Surface Topography-Metrology and Properties* **9**
[20] Wood R J K and Lu P 2021 Leading edge topography of blades–a critical review *Surface Topography: Metrology and Properties* **9** 023001
[21] Grützmacher P G, Jalikop S V, Gachot C and Rosenkranz A 2021 Thermocapillary lubricant migration on textured surfaces - a review of theoretical and experimental insights *Surface Topography: Metrology and Properties* **9** 013001
[22] Sharma N, Verma R, Sharma S and Kango S 2021 Qualitative potentials of surface textures and coatings in the performance of fluid-film bearings: a critical review *Surface Topography: Metrology and Properties* **9** 013002
[23] Lu P and Wood R J K 2020 Tribological performance of surface texturing in mechanical applications—a review *Surface Topography: Metrology and Properties* **8** 043001
[24] Padhan M, Marathe U and Bijwe J 2020 Surface topography modification, Film transfer and Wear mechanism for fibre reinforced polymer composites—An Overview *Surface Topography: Metrology and Properties* **8** 043002
[25] Abdel-Aal H A 2016 Functional surfaces for tribological applications: inspiration and design *Surface Topography-Metrology and Properties* **4**
[26] Nistico R 2018 The importance of surfaces and interfaces in clays for water remediation processes *Surface Topography-Metrology and Properties* **6**
[27] Rosen B G, Eriksson L and Bergman M 2016 Kansei, surfaces and perception engineering *Surface Topography-Metrology and Properties* **4**
[28] Eifler M, Hering J, von Freymann G and Seewig J 2018 Manufacturing of the ISO 25178-70 material measures with direct laser writing: a feasibility study *Surface Topography-Metrology and Properties* **6**
[29] Wang J L, Kirkland N T, Chen X B, Lyndon J A and Birbilis N 2016 On the surface properties of biodegrading magnesium and its alloys: a survey and discussion *Surface Topography-Metrology and Properties* **4**
[30] Vietti L A 2016 Quantifying bone weathering stages using the average roughness parameter Ra measured from 3D data *Surface Topography-Metrology and Properties* **4**
[31] Li X S, Tao D S, Lu H Y, Bai P P, Liu Z Y, Ma L R, Meng Y G and Tian Y 2019 Recent developments in gecko-inspired dry adhesive surfaces from fabrication to application *Surface Topography-Metrology and Properties* **7**
[32] Zhang S W 2016 Recent developments of green tribology *Surface Topography-Metrology and Properties* **4**
[33] MacAulay G D, Senin N, Giusca C L, Leach R K and Ivanov A 2015 Review of feature boundary identification techniques for the characterization of tessellated surfaces *Surface Topography-Metrology and Properties* **3**
[34] Wang J, Leach R K and Jiang X 2015 Review of the mathematical foundations of data fusion techniques in surface metrology *Surface Topography: Metrology and Properties* **3** 023001
[35] Do M T and Cerezo V 2015 Road surface texture and skid resistance *Surface Topography-Metrology and Properties* **3**
[36] Atulkar A, Pandey R K and Subbarao P M V 2021 Role of textured piston rings/liners in improving the performance behaviours of IC engines: a review with vital findings *Surface Topography: Metrology and Properties* **9** 023002
[37] Madsen M H and Hansen P-E 2016 Scatterometry—fast and robust measurements of nano-textured surfaces *Surface Topography: Metrology and Properties* **4** 023003
[38] Stemp W J, Watson A S and Evans A A 2016 Surface analysis of stone and bone tools *Surface Topography-Metrology and Properties* **4**
[39] Abdalla R 2019 Surface nanohardness of enamel after an erosive challenge; a literature review *Surface Topography-Metrology and Properties* **7**
[40] Austin R S, Mullen F and Bartlett D W 2015 Surface texture measurement for dental wear applications *Surface Topography-Metrology and Properties* **3**
[41] Watson A S and Gleason M A 2016 A comparative assessment of texture analysis techniques applied to bone tool use-wear *Surface Topography-Metrology and Properties* **4**
[42] Francisco A, Blondel C, Brunetiere N, Ramdarshan A and Merceron G 2018 Enamel surface topography analysis for diet discrimination. A methodology to enhance and select discriminative parameters *Surface Topography-Metrology and Properties* **6**
[43] Prufrock K A, Lopez-Torres S, Silcox M T and Boyer D M 2016 Surfaces and spaces: troubleshooting the study of dietary niche space overlap between North American stem primates and rodents *Surface Topography-Metrology and Properties* **4**

[44] Kaiser T M, Clauss M and Schulz-Kornas E 2016 A set of hypotheses on tribology of mammalian herbivore teeth *Surface Topography-Metrology and Properties* **4**
[45] Schmidt C W, Beach J J, McKinley J I and Eng J T 2016 Distinguishing dietary indicators of pastoralists and agriculturists via dental microwear texture analysis *Surface Topography-Metrology and Properties* **4**
[46] Arman S D, Ungar P S, Brown C A, DeSantis L R G, Schmidt C and Prideaux G J 2016 Minimizing inter-microscope variability in dental microwear texture analysis *Surface Topography-Metrology and Properties* **4**
[47] Purnell M A and Darras L P G 2016 3D tooth microwear texture analysis in fishes as a test of dietary hypotheses of durophagy *Surface Topography-Metrology and Properties* **4**
[48] Arman S D, Ungar P S, Brown C A, DeSantis L R G, Schmidt C and Prideaux G J 2016 Minimizing inter-microscope variability in dental microwear texture analysis *Surface Topography: Metrology and Properties* **4** 024007
[49] Erickson G M, Sidebottom M A, Curry J F, Kay D I, Kuhn-Hendricks S, Norell M A, Sawyer W G and Krick B A 2016 Paleo-tribology: development of wear measurement techniques and a three-dimensional model revealing how grinding dentitions self-wear to enable functionality *Surface Topography-Metrology and Properties* **4**
[50] Mylonas P, Moazzez R, Joiner A, Bartlett D, Bull T and McBride J 2021 Surface form analysis on complex freeform organic structures–measuring erosive wear on human teeth in vitro *Surface Topography: Metrology and Properties* **9** 025024
[51] Flys O, Jarlemark P, Petronis S, Stenlund P and Rosen B G 2018 Applicability of characterization techniques on fine scale surfaces *Surface Topography-Metrology and Properties* **6**
[52] Zhang Y Y, Song X F and Guo H L 2020 Surface characteristics of dental resin nanoceramic in in vitro finishing with dental handpiece and rotary burs *Surface Topography-Metrology and Properties* **8**
[53] Zabala A, Blunt L, Tejero R, Llavori I, Aginagalde A and Tato W 2020 Quantification of dental implant surface wear and topographical modification generated during insertion *Surface Topography-Metrology and Properties* **8**
[54] Zabala A, Blunt L, Aginagalde A, Llavori I and Tato W 2020 Development of a novel method to characterize mean surface peak curvature as a signature of tribological performance of dental implant surfaces *Surface Topography-Metrology and Properties* **8**
[55] Zhang C, Jiang Z L and Zhao L 2020 Mechanical properties and tribological behaviors of yttria-zirconia ceramics with additions of graphene oxide by hot-press sintering for dental implants *Surface Topography-Metrology and Properties* **8**
[56] Souza J C M, Correia M S T, Henriques B, de Oliveira A P N, Silva F S and Gomes J R 2019 Micro-scale abrasion wear of novel biomedical PEEK-matrix composites for restorative dentistry *Surface Topography-Metrology and Properties* **7**
[57] Jacobs T D B, Junge T and Pastewka L 2017 Quantitative characterization of surface topography using spectral analysis *Surface Topography: Metrology and Properties* **5** 013001
[58] Stemp W J, Morozov M and Key A J M 2015 Quantifying lithic microwear with load variation on experimental basalt flakes using LSCM and area-scale fractal complexity (Asfc) *Surface Topography: Metrology and Properties* **3** 034006
[59] Torabi A, Akbarzadeh S, Salimpour M R and Taei M 2016 Effect of surface roughness pattern on transient mixed elastohydrodynamic lubrication *Surface Topography-Metrology and Properties* **4**
[60] Deltombe R, Bigerelle M and Jourani A 2016 Analysis of the effects of different machining processes on sealing using multiscale topography *Surface Topography-Metrology and Properties* **4**
[61] Gheisari R, Bashandeh K and Polycarpou A A 2019 Effect of surface polishing on the tribological performance of hard coatings under lubricated three-body abrasive conditions *Surface Topography-Metrology and Properties* **7**
[62] Ozbek N A 2021 Optimization of flank wear and surface quality in the turning of 1.2343 tool steel using carbide tools coated via different methods *Surface Topography-Metrology and Properties* **9**
[63] Yang J L, Pu W and Pei X 2021 A deterministic tribofilm growth model considering flash temperature and surface roughness in mixed lubrication *Surface Topography-Metrology and Properties* **9**
[64] Hemanth G, Suresha B and Hemanth R 2019 The effect of hexagonal boron nitride on wear resistance under two and three-body abrasion modes of polyetherketone composites *Surface Topography-Metrology and Properties* **7**
[65] Raghs H A, Kondul B and Cetin M H 2020 Investigation of wear behavior of boronized H13 steel under environment of nano-silver-added lubricants coated with different ligands *Surface Topography-Metrology and Properties* **8**
[66] Abbas S M, Elayaperumal A and Arulvel S 2020 Enhancement of the hardness and wear-resistance of aluminum-silicon alloy using atmospheric plasma-sprayed ZrO2, Al2O3-ZrO2 multilayer, and Al2O3/ZrO2 composite coatings *Surface Topography-Metrology and Properties* **8**
[67] Prajapati D K and Tiwari M 2018 The relation between fractal signature and topography parameters: a numerical and experimental study *Surface Topography-Metrology and Properties* **6**

[68] Rodrigues T A, Arencibia R V, Costa H L and da Silva W M 2020 Roughness analysis of electrochemically textured surfaces: effects on friction and wear of lubricated contacts *Surface Topography: Metrology and Properties* **8** 024011

[69] Zheng M L, Wang B, Zhang W, Cui Y Z, Zhang L and Zhao S H 2020 Analysis and prediction of surface wear resistance of ball-end milling topography *Surface Topography-Metrology and Properties* **8**

[70] Srinivasan D, Veerappan G, Ravichandran M, Chairman C A, Marichamy S, Mohanavel V and Karthick A 2021 Investigation on electric erosion behavior of nickel-based super alloy (Waspaloy: Ni, Cr, Co, Mo, Ti, Al) using response surface methodology *Surface Topography-Metrology and Properties* **9**

[71] Tang H J, Sun J L, Zhao Z L and He J Q 2020 Exploration on tribological behaviour of coumarin as copper rolling oil additive through surface characterization *Surface Topography-Metrology and Properties* **8**

[72] Prajapati D K 2021 Numerical analysis of rough hydrodynamic bearings for various deterministic micro-asperity features *Surface Topography-Metrology and Properties* **9**

[73] Morais R R, Cardoso G V, Ferreira E S and Costa H L 2020 Surface characterization, mechanical and abrasion resistance of nanocellulose-reinforced wood panels *Surface Topography-Metrology and Properties* **8**

[74] Ott D, Soons J, Thompson R and Song J 2017 Identifying persistent and characteristic features in firearm tool marks on cartridge cases *Surface Topography-Metrology and Properties* **5**

[75] Neumann A, Frank D, Vondenhoff T and Schmitt R 2016 Comparison of two metrological approaches for the prediction of human haptic perception *Surface Topography-Metrology and Properties* **4**

[76] Abbott J R and Zhu H P 2019 3D optical surface profiler for quantifying leaf surface roughness *Surface Topography-Metrology and Properties* **7**

[77] Bigerelle M, Marteau J and Blateyron F 2017 Assessing the discriminating power of roughness parameters using a roughness databank *Surface Topography-Metrology and Properties* **5**

[78] Garabedian C, Delille R, Deltombe R, Anselme K, Atlan M and Bigerelle M 2017 A multi-topographical-instrument analysis: the breast implant texture measurement *Surface Topography-Metrology and Properties* **5**

[79] Gujrati A, Sanner A, Khanal S R, Moldovan N, Zeng H J, Pastewka L and Jacobs T D B 2021 Comprehensive topography characterization of polycrystalline diamond coatings *Surface Topography-Metrology and Properties* **9**

[80] Raoufi D 2015 Multi-resolution analysis of nanocrystalline ITO thin films *Surface Topography-Metrology and Properties* **3**

[81] Yadlapalli B K, Maharana H S and Basu A 2020 Structure and properties of pulse electrodeposited Cr-WC coating *Surface Topography-Metrology and Properties* **8**

[82] Guibert R, Hanafi S, Deltombe R, Bigerelle M and Brown C A 2020 Comparison of three multiscale methods for topographic analyses *Surface Topography-Metrology and Properties* **8**

[83] Flys O, Berglund J and Rosen B G 2020 Using confocal fusion for measurement of metal AM surface texture *Surface Topography-Metrology and Properties* **8**

[84] Krishna A V, Faulcon M, Timmers B, Reddy V V, Barth H, Nilsson G and Rosen B G 2020 Influence of different post-processing methods on surface topography of fused deposition modelling samples *Surface Topography-Metrology and Properties* **8**

[85] Bataille C, Deltombe R, Jourani A and Bigerelle M 2017 Joint properties of a tool machining process to guarantee fluid-proof abilities *Surface Topography-Metrology and Properties* **5**

[86] Abele E and Kniepkamp M 2015 Analysis and optimisation of vertical surface roughness in micro selective laser melting *Surface Topography-Metrology and Properties* **3**

[87] Newrkla K, Spenger T and Cihak-Bayr U 2021 Systematic selection and evaluation of relevant surface roughness parameters for the characterisation of the innovative RPM-Synchronous Grinding process *Surface Topography-Metrology and Properties* **9**

[88] Jolivet S, Mezghani S and El Mansori M 2016 Multiscale analysis of replication technique efficiency for 3D roughness characterization of manufactured surfaces *Surface Topography-Metrology and Properties* **4**

[89] Agar S and Tosun N 2021 Ultrasonic assisted turning of AISI 52100 steel using nanoparticle-MQL method *Surface Topography-Metrology and Properties* **9**

[90] Bharathi S R S, Ravindran D and Moshi A A M 2021 Experimental investigation of surface roughness and chip morphology during machining of austenitic stainless steel 303 with pvd coated (TiAlN) insert *Surface Topography-Metrology and Properties* **9**

[91] Cetin M H, Kesen A, Korkmaz S and Kilincarslan S K 2020 Performance evaluation of the nano-silver added vegetable-oil-based cutting fluid in drilling process *Surface Topography-Metrology and Properties* **8**

[92] Pawlus P, Grabon W, Reizer R and Gorka S 2015 A study of variations of areal parameters on machined surfaces *Surface Topography-Metrology and Properties* **3**

[93] Reddy V V, Krishna A V, Schultheiss F and Rosen B G 2017 Surface topography characterization of brass alloys: lead brass (CuZn39Pb3) and lead free brass (CuZn21Si3P) *Surface Topography-Metrology and Properties* **5**
[94] Tao H R 2018 Research on effect of rough surface on FMCW laser radar range accuracy *Surface Topography-Metrology and Properties* **6**
[95] Townsend A, Racasan R and Blunt L 2018 Surface-specific additive manufacturing test artefacts *Surface Topography-Metrology and Properties* **6**
[96] Yasar H and Ekmekci B 2021 The effect of micro and nano hydroxyapatite powder on biocompatibility and surface integrity of Ti6Al4V (ELI) in powder mixed electrical discharge machining *Surface Topography-Metrology and Properties* **9**
[97] Ieshkin A, Kireev D, Chernysh V, Molchanov A, Serebryakov A and Chirkin M 2019 Decomposition of AFM images of ultrasmooth optical surface polished with gas cluster ion beam *Surface Topography-Metrology and Properties* **7**
[98] Chan K S 2015 Characterization and analysis of surface notches on Ti-alloy plates fabricated by additive manufacturing techniques *Surface Topography: Metrology and Properties* **3** 044006
[99] Marathe U, Padhan M and Bijwe J 2020 Exploration of a novel method to treat graphite fibers to enhance the surface topography vis-a-vis fibre-matrix adhesion *Surface Topography-Metrology and Properties* **8**
[100] Mohsenimehr S, Khani M R, Fani N, Eslaminejad M R B, Shokri B and Ghassami A 2020 Surface modification of PLA scaffold using radio frequency (RF) nitrogen plasma in tissue engineering application *Surface Topography-Metrology and Properties* **8**
[101] Krishna A V, Flys O, Reddy V V, Berglund J and Rosen B G 2020 Areal surface topography representation of as-built and post-processed samples produced by powder bed fusion using laser beam melting *Surface Topography-Metrology and Properties* **8**
[102] Garg S K, Datta D P, Basu T, Kanjilal D and Som T 2015 Statistical analysis of ripple morphology on Si surfaces due to 60 keV Ar+-ions *Surface Topography: Metrology and Properties* **4** 015002
[103] Jamshidinia M and Kovacevic R 2015 The influence of heat accumulation on the surface roughness in powder-bed additive manufacturing *Surface Topography-Metrology and Properties* **3**
[104] Singh R and Singh S 2015 Dimensionless analysis for obtaining desired surface finish of plastic replicas prepared by hybrid moulds *Surface Topography: Metrology and Properties* **3** 024004
[105] Chan K S 2015 Characterization and analysis of surface notches on Ti-alloy plates fabricated by additive manufacturing techniques *Surface Topography-Metrology and Properties* **3**
[106] Ellis A, Brown R and Hopkinson N 2015 The effect of build orientation and surface modification on mechanical properties of high speed sintered parts *Surface Topography-Metrology and Properties* **3**
[107] Mireles J, Ridwan S, Morton P A, Hinojos A and Wicker R B 2015 Analysis and correction of defects within parts fabricated using powder bed fusion technology *Surface Topography-Metrology and Properties* **3**
[108] Grimm T, Wiora G and Witt G 2015 Characterization of typical surface effects in additive manufacturing with confocal microscopy *Surface Topography-Metrology and Properties* **3**
[109] Triantaphyllou A, Giusca C L, Macaulay G D, Roerig F, Hoebel M, Leach R K, Tomita B and Milne K A 2015 Surface texture measurement for additive manufacturing *Surface Topography-Metrology and Properties* **3**
[110] Bochmann L, Bayley C, Helu M, Transchel R, Wegener K and Dornfeld D 2015 Understanding error generation in fused deposition modeling *Surface Topography-Metrology and Properties* **3**
[111] Beaucamp A T, Namba Y, Charlton P, Jain S and Graziano A A 2015 Finishing of additively manufactured titanium alloy by shape adaptive grinding (SAG) *Surface Topography-Metrology and Properties* **3**
[112] Kopplmayr T, Hausler L, Bergmair I and Muhlberger M 2015 Nanoimprint Lithography on curved surfaces prepared by fused deposition modelling *Surface Topography-Metrology and Properties* **3**
[113] Bochmann L, Bayley C, Helu M, Transchel R, Wegener K and Dornfeld D 2015 Understanding error generation in fused deposition modeling *Surface Topography: Metrology and Properties* **3** 014002
[114] Grimm T, Wiora G and Witt G 2015 Characterization of typical surface effects in additive manufacturing with confocal microscopy *Surface Topography: Metrology and Properties* **3** 014001
[115] Jamshidinia M and Kovacevic R 2015 The influence of heat accumulation on the surface roughness in powder-bed additive manufacturing *Surface Topography: Metrology and Properties* **3** 014003
[116] Vetterli M, Schmid M, Knapp W and Wegener K 2017 New horizons in selective laser sintering surface roughness characterization *Surface Topography-Metrology and Properties* **5**
[117] Taufik M and Jain P K 2017 Characterization, modeling and simulation of fused deposition modeling fabricated part surfaces *Surface Topography-Metrology and Properties* **5**

[118] Tang S Y, Wang G L and Zhang H O 2019 In situ 3D monitoring and control of geometric signatures in wire and arc additive manufacturing *Surface Topography-Metrology and Properties* **7**
[119] Newton L, Senin N, Smith B, Chatzivagiannis E and Leach R 2019 Comparison and validation of surface topography segmentation methods for feature-based characterisation of metal powder bed fusion surfaces *Surface Topography-Metrology and Properties* **7**
[120] Lou S, Zhu Z, Zeng W, Majewski C, Scott P J and Jiang X 2021 Material ratio curve of 3D surface topography of additively manufactured parts: an attempt to characterise open surface pores *Surface Topography-Metrology and Properties* **9**
[121] Fox J C and Pintar A L 2021 Prediction of Extreme Value Areal Parameters in Laser Powder Bed Fusion of Nickel Superalloy 625 *Surface Topography-Metrology and Properties* **9**
[122] Ali P, Walia R S, Murtaza Q and Ranganath M S 2020 Modeling and analysis of developed Thermal additive Centrifugal Abrasive Flow Machining process *Surface Topography-Metrology and Properties* **8**
[123] Gomez C, Campanelli C, Su R and Leach R 2020 Surface-process correlation for an ink-jet printed transparent fluoroplastic *Surface Topography-Metrology and Properties* **8**
[124] Hsu S M, Jing Y and Zhao F 2016 Self-adaptive surface texture design for friction reduction across the lubrication regimes *Surface Topography-Metrology and Properties* **4**
[125] Greiner C, Merz T, Braun D, Codrignani A and Magagnato F 2015 Optimum dimple diameter for friction reduction with laser surface texturing: the effect of velocity gradient *Surface Topography-Metrology and Properties* **3**
[126] Singh R C, Pandey R K, Rooplal, Ranganath M S and Maji S 2016 Tribological performance analysis of textured steel surfaces under lubricating conditions *Surface Topography-Metrology and Properties* **4**
[127] Chang C S, Hou K H, Chung C K, Tsai T W and Lin J F 2020 Effect of femtosecond laser power and overlap ratio on surface roughness parameters, contact angle, and tribological properties of the textured SKD 61 tool steel with oil lubrication *Surface Topography-Metrology and Properties* **8**
[128] Rosenkranz A, Gruetzmacher P G, Szurdak A, Gachot C, Hirt G and Muecklich F 2016 Synergetic effect of laser patterning and micro coining for controlled lubricant propagation *Surface Topography-Metrology and Properties* **4**
[129] Chaudhary R, Pandey R K and Mazumdar S K 2021 Tribo-behaviours of textured point contacts lubricated with low and high consistency lithium greases under reciprocating motion *Surface Topography-Metrology and Properties* **9**
[130] Koutsoumpas G, Charitopoulos A, Papadopoulos C I and Fillon M 2020 Computational evaluation of dynamic coefficients of thrust bearings; effect of artificial texturing on thermohydrodynamic performance *Surface Topography: Metrology and Properties* **8** 024009
[131] Jin D, Xiao K, Xiang G, Wang Y J, Wang C and Jia H 2021 A simulation model to comparative analysis the effect of texture bottom shape on wear and lubrication performances for micro-groove water lubricated bearings *Surface Topography-Metrology and Properties* **9**
[132] Shi L, Zhang Z H, Liao M D, Zhou C Y and Sun C F 2019 The tribology behaviors of textured graphite-like carbon film under air and aqueous environments *Surface Topography-Metrology and Properties* **7**
[133] Atulkar A, Pandey R K and Subbarao P M V 2021 Performance analysis of two-dimensional section of partially textured piston ring with cavitation boundary conditions *Surface Topography-Metrology and Properties* **9**
[134] Yang J, Fu H, Fu Y H, Jiang J X, He Y Y and Ji J H 2021 Effects of Micro Dimple's Topography Parameters on Wear Resistance of Laser Textured AlCrN Coating Under Starved Lubrication Condition *Surface Topography-Metrology and Properties* **9**
[135] Atulkar A, Pandey R K and Subbarao P M V 2021 Synergistic effect of textured piston ring and nano-lubricant on performance parameters and emissions of IC engine *Surface Topography-Metrology and Properties* **9**
[136] Verma R 2020 Experimental investigations on erosion of carbon steels involving textured surfaces *Surface Topography-Metrology and Properties* **8**
[137] Rao X, Sheng C X and Guo Z W 2019 The influence of different surface textures on wears in cylinder liner piston rings *Surface Topography-Metrology and Properties* **7**
[138] Jiang S Y, Li J B, Liu S, Zhou N N, Yu A B and Deng Y M 2019 Tribological properties of hybrid surface textured GCr15 steel filled by epoxy resin-based material under dry friction *Surface Topography-Metrology and Properties* **7**
[139] Lenart A, Pawlus P and Dzierwa A 2018 The effect of steel disc surface texture in contact with ceramic ball on friction and wear in dry fretting *Surface Topography-Metrology and Properties* **6**
[140] Sánchez J C, Estupiñán H and Toro A 2021 Friction response of bioinspired AISI 52100 steel surfaces texturized by photochemical machining *Surface Topography: Metrology and Properties* **9** 014001
[141] Ballesteros L M, Zuluaga E, Cuervo P, Rudas J S and Toro A 2021 Tribological behavior of polymeric 3D-printed surfaces with deterministic patterns inspired in snake skin morphology *Surface Topography: Metrology and Properties* **9** 014002

[142] Zhang B C, Zhang Z Q, Sun J W and Shao C 2020 Design and wear resistance analysis of bionic roller for folding of automobile body cover parts based on pearl shell surface texture *Surface Topography-Metrology and Properties* **8**
[143] Fu Y H, Zhou Y, Yang Z T and Yang J 2021 Evaluation on the performance of hybrid textured coated tool under conventional cooling environment *Surface Topography-Metrology and Properties* **9**
[144] Hichri Y, Cerezo V, Do M T and Zahouani H 2018 Effect of particles' characteristics and road surface's texture on the tire/road friction *Surface Topography-Metrology and Properties* **6**
[145] Riahi E, Ropert C and Do M T 2020 Developing a laboratory test method for rolling resistance characterisation of road surface texture *Surface Topography-Metrology and Properties* **8**
[146] Lutey A H A and Romoli L 2019 Surface topography following pulsed laser texturing: Implications for adhesion and wettability *Surface Topography-Metrology and Properties* **7**
[147] Edjeou W, Cerezo V, Zahouani H and Salvatore F 2020 Multiscale analyses of pavement texture during polishing *Surface Topography-Metrology and Properties* **8**
[148] Kumar S S and Hiremath S S 2019 Effect of surface roughness and surface topography on wettability of machined biomaterials using flexible viscoelastic polymer abrasive *Surface Topography-Metrology and Properties* **7**
[149] Dumond J, Mendez A, Ranganath A, Di L F and Low H Y 2020 Superhydrophobic surfaces with embedded protective sawtooth ring microstructures *Surface Topography-Metrology and Properties* **8**
[150] Lempesis N, Janka A, Gnatiuk O, van Eijndhoven S J L and Koopmans R J 2020 Predicting bio-inspired candidate surfaces with superomniphobic characteristics *Surface Topography-Metrology and Properties* **8**
[151] Ahlawat S, Singh A, Sharma S K, Mukhopadhyay P K, Singh R and Bindra K S 2020 Mechanical abrasion resistant candle soot based superhydrophobic coating over nanosecond laser textured stainless steel *Surface Topography-Metrology and Properties* **8**
[152] Mandsberg N K and Taboryski R 2017 The rose petal effect and the role of advancing water contact angles for drop confinement *Surface Topography-Metrology and Properties* **5**
[153] Lazzini G, Romoli L, Blunt L and Gemini L 2017 Design and characterization of textured surfaces for applications in the food industry *Surface Topography-Metrology and Properties* **5**
[154] Bergman M, Rosen B G, Eriksson L and Lundeholm L 2020 Material & Surface design methodology-the user study framework *Surface Topography-Metrology and Properties* **8**
[155] Nakanishi Y, Nishi N, Chikaura H, Nakashima Y, Miura H, Higaki H, Mizuta H, Iwamoto Y, Fujiwara Y, Komohara Y and Takeya M 2015 Textured bearing surface in artificial joints to reduce macrophage activation *Surface Topography-Metrology and Properties* **3**
[156] Bellotti R, Furin V, Marsura A, Picotto G B and Ribotta L 2019 Optical measurements of morphology-to-functional parameters on electrical contacts of photovoltaic cells *Surface Topography-Metrology and Properties* **7**
[157] Ben Alaya C, Rezgui B D, Aouida S, Ronda A, Abbarchi M, Khirouni K and Bouaicha M 2019 Effect of texturization on a-Si: H/c-Si hetero-junctions investigated by PCD and mu W-PCD mapping of minority carrier's lifetime *Surface Topography-Metrology and Properties* **7**
[158] Bellotti R, Furin V, Maras C, Picotto G B and Ribotta L 2018 A function-driven characterization of printed conductors on PV cells *Surface Topography-Metrology and Properties* **6**
[159] Morris N, Hart G, Wong Y J, Simpson M and Howell-Smith S 2020 Laser surface texturing of Wankel engine apex seals *Surface Topography-Metrology and Properties* **8**
[160] Miao C W, Guo Z W and Yuan C Q 2021 An experimental study on tribological properties and air tightness of co-textured cylinder liner-piston ring on an engine tester *Surface Topography-Metrology and Properties* **9**
[161] Adjemout M, Brunetiere N and Bouyer J 2016 Numerical analysis of the texture effect on the hydrodynamic performance of a mechanical seal *Surface Topography-Metrology and Properties* **4**
[162] Chen L P, Zhang Y C, Cui Y H, Wang J and Wang M F 2021 Effect of snake-biomimetic surface texture on finger sealing performance under hydrodynamic lubrication *Surface Topography-Metrology and Properties* **9**
[163] Liu K, Liu Z Q, Khan A M, Chen L X and Zhao M 2021 Effects of the inclination angles of DLC end face micro-texture on the tribological properties of dry gas seal rings *Surface Topography-Metrology and Properties* **9**
[164] Walton K, Fleming L, Goodhand M, Racasan R and Zeng W H 2016 High fidelity replication of surface texture and geometric form of a high aspect ratio aerodynamic test component *Surface Topography-Metrology and Properties* **4**
[165] Ganai P, Pandey R K and Dutt J K 2021 Performance improvement of foil air journal bearing employing micro-pocket and textures on top compliant surface *Surface Topography-Metrology and Properties* **9**
[166] Hingawe N D and Bhore S P 2021 Optimal design of surface texture in meso scale air journal bearing *Surface Topography-Metrology and Properties* **9**

[167] Boidi G, da Silva M R, Profito F J and Machado I F 2020 Using Machine Learning Radial Basis Function (RBF) Method for Predicting Lubricated Friction on Textured and Porous Surfaces *Surface Topography-Metrology and Properties* **8**

[168] Saxena I, Liu J T, Ehmann K and Cao J 2015 Periodic surface pattern fabrication via biprism interference micro-machining *Surface Topography-Metrology and Properties* **3** 9

[169] Butt M Z, Ali D, Aftab M and Tanveer M U 2015 Surface topography and structure of laser-treated high-purity zinc *Surface Topography-Metrology and Properties* **3** 13

[170] Lazzini G, Romoli L and Kunieda M 2021 A novel approach for detecting undercuts within surface textures generated by Electrochemical Jet Machining (ECJM) *Surface Topography-Metrology and Properties* **9**

[171] Pillai K V A and Hariharan P 2021 Experimental investigation on the recast layer and performance indicators during nano powder mixed mu ED miling of Ti-6Al-4V *Surface Topography-Metrology and Properties* **9** 15

[172] Jithin S, Bhandarkar U V and Joshi S S 2020 Characterization of Surface Topographies Generated using Circular- and Cylindrical-Face EDT *Surface Topography: Metrology and Properties* **8** 045018

[173] Elaiyarasan U, Satheeshkumar V and Senthilkumar C 2021 Effect of parameters on microstructure of electrical discharge coated ZE41A magnesium alloy with tungsten carbide-copper composite electrode *Surface Topography-Metrology and Properties* **9** 11

[174] Colak B 2021 A comparison of tonnage-dependent shot blast and electro-discharge texturing methods *Surface Topography-Metrology and Properties* **9**

[175] Cuervo P, Lopez D A, Cano J P, Sanchez J C, Rudas S, Estupinan H, Toro A and Abdel-Aal H A 2016 Development of low friction snake-inspired deterministic textured surfaces *Surface Topography-Metrology and Properties* **4**

[176] Sanchez J C, Estupinan H and Toro A 2021 Friction response of bioinspired AISI 52100 steel surfaces texturized by photochemical machining *Surface Topography-Metrology and Properties* **9**

[177] Zhang W, Bai F S, Zhao S H, Zhang L, Wang B and Feng R Y 2021 Analysis of the texture direction of the milled surface on the wear resistance of the workpiece *Surface Topography-Metrology and Properties* **9**

[178] Blateyron F and Leroy B 2021 Optimal characterisation of profile features *Surface Topography-Metrology and Properties* **9**

[179] Bartkowiak T, Berglund J and Brown C A 2018 Establishing functional correlations between multiscale areal curvatures and coefficients of friction for machined surfaces *Surface Topography-Metrology and Properties* **6**

[180] Eifler M, Klauer K, Seewig J, Kirsch B and Aurich J C 2019 Model-based design of areal material measures with component surfaces *Surface Topography-Metrology and Properties* **7**

[181] Fruhauf J, Huser D, Gartner E and Felgner A 2020 Development of Si-chips with anisotropic rough surface *Surface Topography-Metrology and Properties* **8**

[182] Moretti M, Gambucci G, Leach R K and Senin N 2019 Assessment of surface topography modifications through feature-based registration of areal topography data *Surface Topography-Metrology and Properties* **7**

[183] Reavie T, Koulin G, Frazer R C, Wilson S J and Shaw B A 2019 A method to quantify waviness measurement capability of a gear measurement machine *Surface Topography-Metrology and Properties* **7**

[184] Seewig J, Scott P J, Eifler M, Barwick B and Huser D 2020 Crossing-The-Line Segmentation as a Basis for Rsm and Rc Evaluation *Surface Topography-Metrology and Properties* **8**

[185] Uchidate M 2018 Comparison of contact conditions obtained by direct simulation with statistical analysis for normally distributed isotropic surfaces *Surface Topography-Metrology and Properties* **6**

[186] Eifler M, Hering J, Seewig J, Leach R K, von Freymann G, Hu X and Dai G 2020 Comparison of material measures for areal surface topography measuring instrument calibration *Surface Topography-Metrology and Properties* **8**

[187] Flys O, Kallberg S, Ged G, Silvestri Z and Rosen B G 2015 Characterization of surface topography of a newly developed metrological gloss scale *Surface Topography-Metrology and Properties* **3**

[188] Krishna A V, Flys O, Reddy V V and Rosen B G 2018 Surface topography characterization using 3D stereoscopic reconstruction of SEM images *Surface Topography-Metrology and Properties* **6**

[189] Todhunter L, Leach R and Blateyron F 2020 Mathematical approach to the validation of surface texture filtration software *Surface Topography-Metrology and Properties* **8**

[190] Todhunter L, Leach R and Blateyron F 2020 Mathematical approach to the validation of form removal surface texture software *Surface Topography-Metrology and Properties* **8**

[191] Todhunter L, Leach R, Lawes S, Harris P and Blateyron F 2019 Mathematical approach to the validation of functional surface texture parameter software *Surface Topography-Metrology and Properties* **7**

[192] Todhunter L, Leach R, Lawes S, Harris P and Blateyron F 2020 Mathematical approach to the validation of field surface texture parameter software *Surface Topography-Metrology and Properties* **8**

[193] Yue H Z, Deng J X and Schneider J 2021 Development of a new topographical parameter set for characterizing textured rough surfaces *Surface Topography-Metrology and Properties* **9**
[194] Eifler M, Brodmann B, Hansen P E and Seewig J 2021 Traceable functional characterization of surface topography with angular-resolved scattering light measurement *Surface Topography-Metrology and Properties* **9**
[195] Boidi G, da Silva M R, Profito F J and Machado I F 2020 Using Machine Learning Radial Basis Function (RBF) Method for Predicting Lubricated Friction on Textured and Porous Surfaces *Surface Topography: Metrology and Properties* **8** 044002
[196] Lou S, Zhu Z, Zeng W, Majewski C, Scott P and Jiang X 2021 Material ratio curve of 3D surface topography of additively manufactured parts: an attempt to characterise open surface pores *Surface Topography: Metrology and Properties* **9** 015029
[197] Lehmann P, Tereschenko S and Xie W 2016 Fundamental aspects of resolution and precision in vertical scanning white-light interferometry *Surface Topography: Metrology and Properties* **4** 024004
[198] Jäger G, Manske E, Hausotte T, Müller A and Balzer F 2016 Nanopositioning and nanomeasuring machine NPMM-200—a new powerful tool for large-range micro- and nanotechnology *Surface Topography: Metrology and Properties* **4** 034004
[199] Woodcock R, Muhamedsalih H, Martin H and Jiang X Q 2016 Burg algorithm for enhancing measurement performance in wavelength scanning interferometry *Surface Topography-Metrology and Properties* **4**
[200] Regi F, Nielsen J B, Li D, Zhang Y, Frisvad J R, Aanaes H and Tosello G 2018 A method for the characterization of the reflectance of anisotropic functional surfaces *Surface Topography-Metrology and Properties* **6**
[201] Djaghloul M, Abdouni A, Thieulin C and Zahouani H 2018 Wave propagation as a marker of structural and topographic properties of human skin *Surface Topography-Metrology and Properties* **6**
[202] Ding Y, Xi J T, Yu Y G, Deng F Q and Cheng J 2016 Multiple spatial-frequency fringes selection for absolute phase recovery *Surface Topography-Metrology and Properties* **4**
[203] den Boef A J 2016 Optical wafer metrology sensors for process-robust CD and overlay control in semiconductor device manufacturing *Surface Topography: Metrology and Properties* **4** 023001
[204] Bodermann B, Ehret G, Endres J and Wurm M 2016 Optical dimensional metrology at Physikalisch-Technische Bundesanstalt (PTB) on deep sub-wavelength nanostructured surfaces *Surface Topography-Metrology and Properties* **4**
[205] Pan T T, Yang J, Wu W, Dung Z G and Ayinde B O 2019 Artificial intelligent matching for scratches of semiconductor wafers based on a K-NN algorithm *Surface Topography-Metrology and Properties* **7**
[206] https://publishingsupport.iopscience.iop.org/double-anonymous-faqs/.
[207] Todhunter L, Leach R and Blateyron F 2020 Mathematical approach to the validation of form removal surface texture software *Surface Topography: Metrology and Properties* **8** 045019
[208] Marteau J, Anselme K, Pieuchot L, Chauvy P-F and Bigerelle M 2021 Topography characterization of sinusoidal surfaces obtained with electrochemical machining *Surface Topography: Metrology and Properties* **9** 025002
[209] Wang J, Zou R, Colosimo B M, Lu W, Xu L and Jiang X J 2021 Characterisation of freeform, structured surfaces in T-spline spaces and its applications *Surface Topography: Metrology and Properties* **9** 025003
[210] Tong Z, Zeng W, Zhong W and Jiang X 2021 A closed-loop feature-based FTS patterning and characterisation of functional structured surfaces *Surface Topography: Metrology and Properties* **9** 025012
[211] Cho H, Kim T and Kim S 2021 Tunable thickness and uniform drop deposition of graphene oxide on porous anodic aluminum oxide and a reliable thickness measurement technique *Surface Topography: Metrology and Properties* **9** 025026
[212] Fox J C and Pintar A L 2021 Prediction of Extreme Value Areal Parameters in Laser Powder Bed Fusion of Nickel Superalloy 625 *Surface Topography: Metrology and Properties* **9** 025033
[213] Lifton J J, Liu Y, Tan Z J, Mutiago B, Goh X Q and Malcolm A 2021 Internal surface roughness measurement of metal additively manufactured samples via X-ray CT: the influence of surrounding material thickness *Surface Topography: Metrology and Properties*