SCHOLARLY PUBLICATIONS
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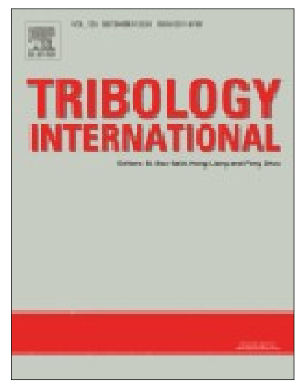
Journal Name: Tribology International **IF: 7.6**

Title: Synergistic effect of SiC and MoS2 on the tribological performance of Al-based composites

Author: Jha P.; Gautam R.K.S.; Tripathi V.M.; Kumar R.; Gupta G.; Ali S.

Details: Volume-224, December 2026

Abstract: This study investigates the friction and wear properties of aluminum (Al)-based composites, reinforced with a fixed amount of SiC (5 wt%) and varying amounts of MoS_2 (2, 4, and 6 wt%), and processed via powder metallurgy route. Microstructural examination has confirmed the formation of a dense, well-bonded structure consistent with the measured density and micro-hardness. The wear tests were conducted using a pin-on-disk test rig against EN31 steel under normal loads of 10, 20, and 30 N, with a constant sliding speed of 1 m/s. Among all the tested materials, the hybrid compositeAl - SiC (5 wt%) - MoS_2 (2 wt%) demonstrated most superior tribological performance, exhibiting the lowest coefficient of friction (0.20) at 20 N and the lowest wear rate (2.24×10^{-4} mm^3/m) at 10 N. FESEM analysis of the worn surfaces revealed that the dominant wear mechanism got transitioned from predominantly adhesive wear in pure Al to abrasive wear in the Al-SiC-MoS_2 composites. In the Al-SiC (5 wt%)-MoS_2 (6 wt%) composite, mild delamination was identified as the dominant wear mechanism under a relatively high load of 30 N. Furthermore, the wear tracks and surface morphology of the hybrid composite Al-SiC (5 wt%)-MoS_2 (2 wt%) exhibited the formation of a dense and compacted tribolayer. This layer consisted of an optimal content of MoS_2 acting as a solid lubricant, Al_2O_3 and MoO_3 forming a passivation layer, and SiC serving as a load-bearing constituent within the mechanically mixed layer, thereby reducing the coefficient of friction and wear rate.



URL: https://www.sciencedirect.com/science/article/pii/S0301679X26006833?via%3Dihub

Journal Name: Results in Surfaces and Interfaces **IF: 6.2**

Title: Optimized microstructural, mechanical, and tribological properties of Ti-6Al-4V nanocomposites for next-generation dental implant applications

Author: Panda S.R.; Chakrabarty S.; Mishra P.C.; Munuswamy D.B.; Devarajan Y.; Raja T.; Jayabal R.; Mehar K.

Details: Volume 24, August 2026

Abstract: Ti-6Al-4V alloy is extensively used for biomedical and dental implant applications due to its outstanding biocompatibility, corrosion resistance and favorable mechanical strength. However, its limited wear resistance, and long-term stability necessitate further improvement. This study investigates the effects of TiO_2, yttria-stabilized zirconia (YSZ), hydroxyapatite (HAp), and chitosan nanoparticles on the densification, microstructural features and mechanical/tribological behaviour of Ti-6Al-4V matrix nanocomposites. The nanocomposites were fabricated using powder metallurgy route followed by conventional sintering at 1500 °C in a hydrogen atmosphere. Reinforcements were incorporated at 5, 10 and 20 wt % concentrations. FESEM and XRD analyses confirmed a homogeneous dispersion and strong interfacial bonding between nanoparticles and Ti matrix. The addition of reinforcements significantly enhanced densification behaviour, hardness, compressive strength, impact strength, and wear resistance compared with pure Ti-6Al-4V alloy. Nanocomposites containing 5 wt % reinforcement exhibited superior densification with reduced internal cracks and voids, indicating improved structural integrity. Increasing reinforcement content further contributed to superior mechanical and tribological performances. Based on the observed microstructural, mechanical, and tribological characteristics, and biomechanical requirements reported in the literature for stable dental implant materials, Ti+10 wt % TiO_2, Ti+ 10 wt % YSZ, and Ti+ 10 wt % chitosan nanocomposites emerged as the most promising candidates for future dental implant applications. The study highlights the potential of nanoparticle-reinforced Ti-6Al-4V nanocomposites as advanced, durable and high-performance dental implant materials. Copyright.

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Journal Name: Scientific Reports **IF: 4.9**

Title: Performance and surface integrity studies in electric discharge machining on Ti-6Al-4 V using neem oil dielectric and 3D Printed SS316L electrode

Author: Barik S.; Nanda B.K.; Mishra S.B.; Satpathy M.P.; Debebe S.T.

Details: Volume-16, Issue-1, December 2026

Abstract: Bio-dielectric fluids and advanced 3D printed electrodes are essential for sustainable, precise Electric Discharge Machining (EDM) of critical Ti-6Al-4 V aerospace components. In this study, neem biodiesel dielectric and a precisely manufactured 3D-printed stainless-steel electrode were used to identify optimal EDM parameters that maximize material removal rate (MRR) and minimize tool wear rate (TWR) and surface roughness (SR). The experiments were carried out using response surface methodology (RSM) with Box–Behnken design (BBD). Regression models showed high predictive accuracy ($R^2 > 0.98$). An integrated MEREC-CoCoSo multi-response optimization approach was subsequently applied to the experimental results to obtain the best output values. The results revealed the optimal setting as current (I_p) of 30 A, pulse-on time (T_{on}) of 0.3 s, and voltage gap (V_g) of 60 V. The interaction between T_{on} and V_g strongly influenced MRR, TWR, and SR. MRR first increased and then slightly decreased as V_g was raised from 60 V to 80 V. It also showed a marginal increase as T_{on} increased from 0.2 s to 0.4 s. In contrast, both TWR and SR increased sharply with higher V_g and longer T_{on}. Surface morphology analysis at the optimal setting showed fewer surface flaws, smaller craters, thinner recast layers, and lower porosity. Energy-dispersive X-ray spectroscopy (EDX) analysis confirmed the transfer of material from the 3D-printed electrode to the workpiece. This work provides a practical guide for industrial applications, demonstrating the feasibility and benefits of using novel electrode materials and eco-friendly dielectrics in sustainable EDM.

URL: https://www.nature.com/articles/s41598-026-51103-y

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Journal Name: Information (Switzerland) **IF: 4.3**

Title: The Application of Metaverse Technologies in Supply Chain Management: A Sustainable and Resilient View

Author: Dash S.; Rath S.; Tripathy S.; Singhal D.

Details: Volume-17, Issue-6, June 2026

Abstract: In this paper, the different emerging metaverse technologies are identified, and a comprehensive understanding of the various technologies that can empower supply chains in various parts of the world is provided. It also presents a structure that shows how each of these classified technologies would work towards a robust and sustainable supply chain. Moreover, the study uses the fuzzy TOPSIS method to determine the most significant metaverse technology that can significantly enhance the resilience and sustainability of the supply chain networks across the world. The basic aim of this research is to arm the organizations with the latest technology in the metaverse, which enables them to develop a future-proof supply chain network capable of surviving in this ever-evolving world.

URL: https://www.mdpi.com/2078-2489/17/6/569

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Journal Name: International Journal of Adhesion and Adhesives **IF: 4.0**

Title: Adhesion and fracture behaviour of curved FRP composite single-lap joints using 1D and 2D functionally graded adhesives: A 3D finite element study

Author: Behera R.K.; Parida S.K.

Details: Volume 150, September 2026

Abstract: This paper presents Three-Dimensional (3-D) non-linear Finite Element (FE) analyses to assess the structural behaviour of curved laminated Fibre Reinforced Plastic (FRP) composite panel-based Single Lap Joints (SLJs) with Functionally Graded Adhesive (FGA) featuring pre-embedded adhesion failure. The principle of the fracture mechanics concept is used to investigate the behaviour of interfacial stresses (peel and shear stresses) along the adhesion failure fronts at critical locations. Corresponding three modes of Strain Energy Release Rates (SERRs) are considered as the damage growth parameters and are evaluated using Linear Elastic Fracture Mechanics (LEFM) based Virtual Crack Closure Technique (VCCT). One of the most significant benefits of FGAs over homogeneous adhesives is that the material properties change continuously in the desired direction from point to point, although these materials are microscopically inhomogeneous. FGA bonded joints have a continuous change in the adhesive properties throughout the bonded region, allowing for the homogeneity of stress distribution and load transmission to increase the load-carrying capacity. A series of numerical simulations has been performed using both unidirectional (1D) and bidirectional (2D) FGA gradation schemes to identify effective material grading profiles for reducing interfacial stresses and fracture driving forces. The optimum FGA configurations reduced the peak peel stress by up to 68.44%, the longitudinal shear stress by 41.18%, the transverse shear stress by 56.15%, and total SERR by 11.61% compared with the homogeneous adhesive. These results demonstrate the effectiveness of adhesive property gradation in mitigating adhesion failure, enhancing damage tolerance, and extending the service life of curved composite bonded joints.

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Journal Name: Next Nanotechnology **IF: 3.7**

Title: Nanostructured titanium composites in dental implantology: Design, structure-property relationships, biological safety and clinical translation

Author: Panda S.R.; Mishra P.C.; Kar A.K.

Details: Volume 10, December 2026

Abstract: Titanium and titanium alloys remain the dominant dental implant materials because of their strength, corrosion resistance and capacity for osseointegration. However, conventional titanium surfaces do not fully solve clinically relevant problems such as delayed integration in compromised bone, peri-implant infection, stress shielding, aesthetic grey shine-through, corrosion-assisted ion release and limited capacity for local drug delivery. Nanostructured titanium composites and nanocomposite coatings are therefore being developed to combine the mechanical reliability of titanium with nanoscale bioactivity, antibacterial function and controlled surface chemistry. This revised review addresses the specific gap left by earlier reviews: it classifies titanium-based nanocomposites by reinforcement chemistry and implant function, and connects nanoscale reinforcement size, morphology, dispersion and interfacial stability with mechanical, corrosion, osteogenic and antibacterial performance. Key aspects of ceramic, metallic, carbon-based, polymeric and bioactive and functionally graded (FG) titanium nanocomposites are critically analysed in terms of hydroxyapatite crystallinity, phase stability, coating adhesion as well as surface roughness, wettability, nano-topography and passive oxide-layer protection in oral environments. The quantitative findings of representative studies are summarized differentiating experimentally achieved performance gains from those proven clinically beneficial. It also reviewed the cytotoxicity and long-term risks of silver, nickel/cobalt, graphene derivatives, nanotubes and detached nanoparticles. While in vitro and animal studies support enhanced osteoblast response, corrosion protection and antibacterial activity, clinical evidence is thin, heterogeneous, and insufficient to confidently assert 3D-printed metal structures offer improved long-term implant survival - hydroxyapatite [HA]-coated or micro-rough titanium systems have well-established results. Next steps toward translation will require standardized assays, reproducible manufacturing, validated sterilization process and in vivo studies with proper power that would allow clinical trials.

URL: https://www.sciencedirect.com/science/article/pii/S2949829526002287?via%3Dihub

SCHOLARLY PUBLICATIONS
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Journal Name: Journal of Adhesion Science and Technology **IF: 3.4**

Title: Influence of material properties on pre-embedded adhesion failure and delamination behaviour in curved laminated FRP composite Single Lap Joints

Author: Behera R.K.; Parida S.K.

Details: 24th June, 2026

Abstract: In this paper, the effect of material properties (degree of anisotropy) of the curved laminated Fibre Reinforced Plastic (FRP) composite adherends on the growth of pre-embedded adhesion failure and delamination damage in Single Lap Joint (SLJ), has been investigated. The material properties of the adherends of the SLJ significantly influence the state of stresses (interfacial and inter-laminar stresses) near the pre-embedded damage front, thereby altering the magnitude and distribution of the Strain Energy Release Rate (SERR). The phenomenon becomes more critical when there is a stiffness imbalance between the lap and strap adherends, resulting in increased stress concentrations and accelerated damage growth. To identify materials that minimize SERR and enhance joint integrity, five laminated FRP composites are evaluated as adherend materials for the SLJ: Boron/Epoxy (B/E), Kevlar/Epoxy (K/E), Graphite/Epoxy (Gr/E), Glass/Epoxy (Gl/E), and Carbon/Epoxy (C/E), each with varying anisotropy ratios. A comprehensive three-dimensional (3-D) finite element analysis (FEA) incorporating pre-embedded defects and the Virtual Crack Closure Technique (VCCT) is employed to compute mode-wise and total SERRs. The results show that SLJs made with K/E or Gl/E adherends exhibit superior resistance to both adhesion and delamination failure, provided the strength criteria are met. These findings offer valuable insights into optimal material selection for enhancing the durability and mechanical performance of curved FRP composite-based joints.

URL: https://www.tandfonline.com/doi/full/10.1080/01694243.2026.2691998