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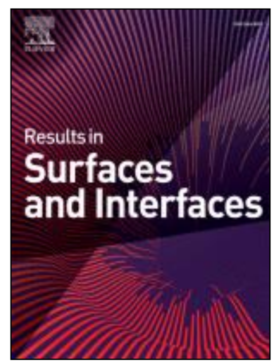
Journal Name: Results in Surfaces and Interfaces **IF: 6.2**

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.



URL: https://www.sciencedirect.com/science/article/pii/S2666845926001613?via%3Dihub

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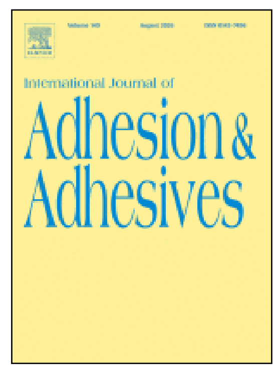
Journal Name: International Journal of Adhesion and Adhesives **IF: 4.0**

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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