

ABSTRACTS

14th WORLD CONGRESS OF THE RSAI

**Sustainable
Regional Economic
growth:
Global challenges
and
new regional
development trajectories**

14TH RSAI WORLD CONGRESS

8-11 APRIL

2024

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Sustainability and Environmental Aspects of the Increased Adhesive Joint Strength of a Surface Treated Metals and Polymers

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Abstract

This study focuses on the sustainability and environmental benefits achieved through the enhanced adhesive joint strength of surface-treated metals and polymers. By adopting specific surface treatment technologies, including laser and cold plasma treatments, we significantly increase the adhesive joint strength between metals and polymers. This improvement in adhesive efficiency enables a reduction in the quantity of adhesive material required, leading to both economic savings and a decrease in environmental impact. The research systematically examines the effects of microtopography modifications on the adhesive joint strength and explores the potential for adhesive material savings. Experimental results demonstrate that targeted surface treatments can lead to a notable increase in joint strength, thereby permitting the use of lesser adhesive quantities without compromising the joint's integrity. This approach not only contributes to material efficiency but also aligns with the principles of sustainable manufacturing and green chemistry by minimizing waste and reducing the environmental footprint of adhesion processes. The findings offer valuable insights for industries seeking to enhance the sustainability of their bonding applications, particularly in sectors such as automotive, aerospace, and electronics, where high-strength, durable adhesive joints are essential. The sustainability and environmental benefits of increasing the adhesive joint strength through surface treatment of metals and polymers can be achieved and understood through several key findings:

Reduced Adhesive Quantity: Specific surface treatments, particularly the turned, sandblasted, and plasma-treated surface, significantly increase the adhesive joint strength. This elevated strength implies that less adhesive material is required to achieve or maintain the desired bond strength, leading to material savings. Less adhesive use translates directly to reduced environmental impact, as it minimizes the production and disposal of adhesive materials.

Waste Reduction: The surface treatments enhance the wettability and adhesive properties of the materials, which not only improves bond strength but also potentially reduces waste during the manufacturing process. Better adhesive properties mean fewer errors and retries, resulting in less waste generated and a lower environmental footprint.

Longevity and Durability: Enhanced adhesive joint strength contributes to the longevity and durability of the bonded components. This means that products may have a longer lifespan and require less frequent replacement, reducing the demand for raw materials and energy for manufacturing new products, and decreasing the volume of waste sent to landfills.

Chemical Savings: The surface treatments modify the chemical composition and physical properties of the materials' surfaces, leading to improved adhesive properties without the need for additional chemical additives or bonding agents. This can lead to a reduction in the use of potentially harmful chemicals, aligning with the principles of green chemistry.

Keywords

Adhesives, metals, savings, surface treatment.