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Overview of Surface Composites

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Description

Surface composites are a good choice for engineering applications that include surface interactions. Friction stir processing (FSP) is gaining popularity as a method for creating surface composites. Surface qualities like as abrasion resistance, hardness, strength, ductility, corrosion resistance, fatigue life, and formability can all be improved by FSP without impacting the material's bulk properties. FSP was first used to create surface composites in aluminium and magnesium alloys. Steel and titanium-based alloys have recently been reported as surface composites. While the impact of process parameters and tool characteristics on FSP of various alloys has been extensively studied over the last decade, the fabrication of surface composites by FSP and the relationship between microstructure and mechanical properties of FSPed surface composites, as well as the underlying mechanisms, have remained largely unknown. Friction stir treated surface micro-composites, nano-composites, in-situ composites, and hybrid composites are examined in terms of microstructure and mechanical properties. A brief note on tool materials and their limitations is also presented, given the importance of tool wear in FSP of high melting point and hard surface composites. The addition of reinforcement to the surface rather than the bulk increases the composite's mechanical properties and improves its surface qualities. Friction stir processing (FSP) is a solid-state processing method for surface composite manufacturing. The FSP is a suitable and energy-efficient approach for producing surface composites when compared to the traditional liquid state processing route. The FSP is a variation of the friction stir welding (FSW) technique that is performed at a lower temperature than the melting temperature of the base metal. The heat effect of FSP surface composite preparation on the treated material is low. FSP's aluminium surface composites improve the Al-base alloy's surface characteristics [1-3].

Corrosion is an inherent process that occurs in all environments. It's a process of material deterioration. To assess a material's corrosion rate, an electrochemical analysis is performed. A potentiostat is a device that is used to study materials' electrochemical behaviour. Standard methods for measuring corrosion rate include potentiodynamic polarisation (PDP), polarisation resistance (Rp), electrochemical impedance spectroscopy (EIS), and cyclic polarisation (CP). When compared to traditional weight loss measurement procedures, these approaches are significantly more exact and deliver precise findings. This method is quicker and aids in understanding the various corrosion processes that occur on the material surface. Composite materials made from renewable agricultural and biomass raw materials are becoming increasingly popular because they effectively compensate for the usage of fossil fuels and minimise greenhouse gas emissions when compared to traditional materials made from petroleum. Natural fibres in polymers, on the other hand, present a number of obstacles, such as high water absorption and low thermal characteristics, which must be overcome in order to produce materials with properties equal to typical composite materials.

Synthetic resins have the drawback of limiting processing due to high viscosity upon melting, a phenomena that occurs during injection moulding, and the finished product is difficult to recycle. This issue can be overcome by adopting a thermorigid-biological matrix made of vegetal oil resin, which does not require polymerization because it is biodegradable. Bio-polymers are made from renewable resources and, in comparison to petroleum-based polymers, have gained in importance in recent years. Sandarac, Copal, and Dammar are among the most often used vegetal resins. These natural resins are water insoluble, but they are moderately soluble in oil, alcohol, turpentine, and petrol. They form solutions that can be used as covering polishes when mixed with specific organic solvents. In this huge backdrop environment, industrial engineering technology and productivity have dramatically improved under the new market economy scenario in the new era, along with the continued growth of science and technology and its wide application. Thermosetting phenolic resin (PF) and thermoplastic phenolic resin (PF) are two types of phenolic resin. Thermoplastic PF, for example, has a high melting point and good flame retardant capabilities, as well as the ability to be formed into high-insulation electrical properties. People have been using these polishes to adorn and protect artworks, musical instruments, and furniture since the Middle Ages. Natural varnishes have the disadvantage of not being able to produce viscous resins [4,5].

Conflict of Interest

None.

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