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Industrial applications of Polymer Composite Materials

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Commentary

Polymeric composites are commonly employed in industrial settings. This is due to several benefits provided by composite materials. Low weight, improved mechanical qualities, and high durability are just a few of the benefits. Automotive, military, aerospace, sports and leisure, and industrial construction are among the industries studied. Composites are materials made up of two or more physically and chemically different phases. Several interfaces separate the different stages that make up a composite. As a result of the combination, the material's structural and functional qualities are improved. Composite materials have a multitude of benefits, including strong corrosion resistance, high fatigue strength, and low weight. Because of the benefits associated with composites, they are now widely used. Composite materials are used in a wide range of industries, including aerospace, automotive, sports leisure goods, military, and biomedical. A matrix phase and a dispersion phase make up composite materials. The matrix phase is the principal phase and has a continuous character. The matrix phase is responsible for holding and sharing the load with the scattered phase. On the other hand, the dispersed phase is discontinuous in nature and is embedded in the matrix. The secondary phase is the dispersion phase, also known as reinforcement. The dispersion phase is usually more powerful than the matrix phase. Examples include wood, which has lignin as the matrix and cellulose fibers as the dispersion phase. Another example of a composite material is reinforced concrete, which contains steel as the dispersion phase and concrete as the matrix.

Automobile industry application

Because of the cost savings and lightweight nature of PMCs, the automotive industry is one of the main users. The mechanical qualities of PMCs are particularly crucial in vehicle design to address some of the most pressing requirements, such as a reduction in overall vehicle weight. The rationale for this is because reducing vehicle weight improves fuel efficiency while also lowering exhaust emissions and so lowering air pollution. A 25% reduction in car mass is predicted to save around 250 million barrels of crude oil, while a 10% reduction in car weight increases fuel efficiency by 6% to 8%. More research into existing polymer resources such as waste plastics has been considered to meet the demand for light-weight materials for vehicle applications and other commercial objectives. For the expanding worldwide demand for new materials, work has recently been done to promote the usage of secondary materials rather than generating new ones. Furthermore, there is a need to step up efforts to identify application areas that are compatible with the potentials encoded in derived materials. Regulations in developed countries requiring the use of a large proportion of biodegradable materials in autos, aerospace, biomedical devices, and a variety of other sectors made this imperative. Some natural fillers have also been observed to increase the mechanical characteristics and degradation of synthetic polymers, which has proven helpful to the environment due to rapid breakdown. Due to concerns such as high moisture absorption and flammability, the usage of natural fiber polymer composites (NFPC) in vehicle parts still has significant drawbacks. As a result, it's critical to solve such concerns to prevent these parts from failing in the field. As a result, they are blended with synthetic fibers using hybridization procedures to create hybrid composites with improved mechanical and structural qualities and lower costs.

Aerospace application

When it comes to advanced composites, the aircraft sector is one of the most active users. According to estimates, the aircraft sector consumes over half of all advanced composites produced in the United States. Some of the factors that encourage the use of these materials in the aerospace industry are like those that drive the use of these materials in the automobile industry. In this industry, weight reduction, cost savings, and radiation shielding are top priorities. Weight loss is critical since it affects a variety of parameters, including fuel efficiency, speed, the number of assembled parts, maneuverability, and range. When compared to metal counterparts, polymer matrix enhanced with nanofillers has been found to give better radiation shielding. Due to its low electron density and generation of secondary particles, aluminum, which was formerly used for this purpose, has lower attenuation characteristics. The insulating characteristic of polymer composite materials, as well as the option of constructing them with high-Z fillers that are nontoxic and give better X-ray protection, contribute to their shielding efficiency. Other advantages of using FRP composites in aircraft include design flexibility, reduced scrap, improved corrosion and fatigue resistance, increased strength and stiffness, resistance to flame and heat for interior panels, improved damage and impact tolerance, durability, reduced noise level, vibration-damping properties, and fracture resistance. Polymer composites can now be utilized for aircraft brakes, bulkheads, window frames, rotors, brackets, fuselage, aircraft wing boxes, airframe, fittings, blades, vertical fins, food tray arms, and tail assemblies, among other applications [1-3].

Biomedical Application

With the most recent breakthroughs in the usage of polymer composite materials, the medical profession is acknowledged as the leading industry. These materials' remarkable features, which include suitable mechanical strength, biodegradability, precise control, biocompatibility, biomimicry, compactness, and bioresorbable, among others, make them ideal for biomedical applications. Because of their biocompatibility, biopolymer materials can cleverly mimic the morphological properties of biological materials. Wound dressing, medical devices, tissue engineering, dental usage, oral tissues, protein immobilization, medication delivery, regenerative medicine, bones and ligament application, blood vessels, antimicrobial materials, and surgical implants are only a few of their applications. Natural polymers such as chitosan, collagen, guar gum, alginates, agar, pectin, psyllium, pullulan, starch, and cellulose are used in the biomedical field, as well as synthetic polymers such as polyamide (PA), polyglycolic acid (PGA), polylactic acid (PLA), polycaprolactone (PCL), polylactic-co-glycolic acid (PLGA), and polyester amides (PE Other uses include hard (bone) and soft (skin) tissues in a broad sense. As a result, PMC are used as bone fillers to help with bone fracture repair, which is one of the most frequent bone ailments. Due to their superior mechanical and biological qualities, both natural and synthetic degradable polymer composites are widely employed as scaffolds for bone repair. After establishing the usage of these materials as biomedical materials, sustainability and environmental effect were also considered, and so environmentally sustainable HA synthesis techniques were devised and employed to produce hydroxyapatite powders

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(HAp). HAps are currently produced from plants and animals utilizing all available manufacturing techniques [4-5].

References

1. Zindani, Divya, and K. Kumar. "Industrial applications of polymer composite materials." Adv Compos Mater (2018): 1-15.
2. Nambiar, Shruti, and John TW Yeow. "Polymer-composite materials for radiation protection." ACS Appl Mater Interfaces 4(2012): 5717-5726.
3. Kumar, Rajiv, Mir Irfan Ul Haq, Ankush Raina, and Ankush Anand. "Industrial applications of natural fibre-reinforced polymer composites–challenges and opportunities." Int J Sustain Eng 12(2019): 212-220.
4. Ramakrishna, S., J. Mayer, E. Wintermantel, and Kam W. Leong. "Biomedical applications of polymer-composite materials: a review." Composites scitech 61 (2001): 1189-1224.
5. Hsissou, Rachid, Rajaa Seghiri, Zakaria Benzekri, Miloudi Hilali, Mohamed Rafik, and Ahmed Elharfi. "Polymer composite materials: A comprehensive review." Composite structures 262 (2021): 113640.

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