A study on Carbon Fiber Based Polymer Rein Force composites

P.K.Chidambaram, Dr. Amol Lokhande, Dr. M. Ramachandran, M. Nathiya, G. Mathivanan

New Prince shri bhavani college of Engg. & Tech Chennai, Tamil Nadu, India.

School of Engineering and Technology, Sandip University. Maharashtra, India.

REST LABS, Kaveripattinam, Krishnagiri, Tamil Nadu, India.

Email: hodmech@newprinceshribhavani.com

Abstract

Functional compounds are materials with mechanical integrity, whose functional properties can be achieved, enhanced or enhanced by a combination of two or more components. ... Non-functional carbon material and two- and three-dimensional materials. Energy conversion and storage materials and structures. Compounds are generally characterized compounds (CAMCs). Polymer Matrix - Polymer matrix compounds (PMC) can be divided into three subtypes: thermoses, thermoplastic and rubber. A polymer is a large molecule formed by repeating structural units bonded by covalent chemical bonds. Structural compounds are engraved products made of plastic, wood, glass or carbon fiber materials. Developed or extruded products have applications such as exterior floors, rails, fences, natural wood, cladding, sidewall, molding, trim and window or door frames. Structural compounds are engraved products made of plastic, wood, glass or carbon fiber materials. Developed or extruded products have applications such as exterior floors, rails, and fences, natural wood, cladding, sidewall, molding, trim and window or door frames. A particle is not a long dimension. Particle compounds the particles of one substance are scattered in the the second object team. Particles can have any shape and size, but generally spherical, a particle composite is classified as a group of suspended particles. Particles can have any shape, size or structure. Examples of well-known particle composites are concrete and particle board.

Introduction

Structural compounds are engraved products made of plastic, wood, glass or carbon fiber materials. Developed or extruded products have applications such as exterior floors, rails, and fences, natural wood, cladding, sidewall, molding, trim and window or door frames. A particle is not a long dimension. Particle compounds the particles of one substance are scattered in the The second object team. Particles can have any shape and size, but are usually spherical, elliptical, polygonal or irregular in shape. Structural compounds are engraved products made of plastic, wood, glass or carbon fiber materials. Developed or extruded products have applications such as exterior floors, rails, and fences, natural wood, cladding, sidewall, molding, trim and window or door frames. Reinforced composites are the most widespread type of polymer composite used today. This structure Materials use polymer matrix, fully bonded reinforcements; This without polymer Reinforcements provide relatively poor mechanical properties. A particle is not a long dimension. Particle compounds the particles of one substance are scattered in the matrix of the second substance. Particles can have any shape and size, but are usually spherical, elliptical, polygonal or irregular in shape. A composite material has different physical and chemical properties Is a combination of two ingredients. When they are connected, they are specific can improve strength and rigidity by doing work. The compounds Have very high strength-to-weight ratios. The strength-to-weight ratio of any material is its strength Is comparable to its weight. ... By combining specific resins and reinforcements, any You can create a composite material to meet the specific strength of the application. Requirements. From two or more element materials. Plywood-like composite wood. Reinforced plastics such as fiber-reinforced polymer or fiberglass. Compounds are now used in vehicles and equipment, including panels, frames, interiors and other components. Some integrated infrastructure applications include buildings, roads, bridges and piling. [8] The crystal phases of pure Fe-Fe₂O₃ polyhedrons have different GO weight ratios and are of three types The α -Fe₂O₃ / GO mono hydrides are 5% and 10%, respectively. A further 15% (named as 3-Fe₂O₃. GO 1, α -Fe₂O₃ / GO 2, and α -Fe₂O₃ / GO 3 were X-rayed, respectively. Were examined by diffraction (XRD). Made by Crystallized. Fe₂O₃ is the peak formed when nano polyhedrons combine with oxide Change and other peaks are almost negligible, forming a mixture of α -Fe₂O₃ and grapheme oxide. Structure and crystalline-Fe₂O₃ nanoparticles. 24.0 °, 33.0 °, 35.5 °, 40.7 °, 49.3 °, 54.0 °, 57.6 °, 62.3 °, 63.9 °, 71.8 °, and 75.3 ((1042) (13), (024), (024), respectively 116), (018), (214), (300), (1010), and (220) -Fe₂O₃ Nocturnal crystalline planes of polyhedrons. [51] Each sensitivity test was performed as shown in Figure 1a under a four-point curve. All sensors have two mounting points Are located in between; Therefore, the bending moment provides them and the unloading cycles, the latter gradually increasing until the beam with maximum load cycles fails. Resistance (strain or damage) ED For urine

sensitivity tests, the current between the external contacts is adjusted At 1 mA with AC / DC current source, the voltage between the internal contacts using a digital Is measured, so the resistance can be calculated using the Ohm's law. [42] The The crystal phases of pure Fe-Fe 2 O 3 polyhedrons have different GO weight ratios and the three types of α -Fe 2 O 3 / GO monohybrids are 5%, 10% and 15%, respectively. Labeled (3-Fe 2 as O 3 GO 1, - Fe 2 O 3 / GO 2, and α -Fe 2 O 3 / GO 3 were examined by X-ray diffraction (XRD), respectively. JCPDS 33- According to card 0664, all variants are rhombohedra-Fe 2 O 3 phase. The peaks are all strong and show a sharp feature, i.e. all are well The peak change that occurs when crystallized Fe 2 O 3 polyhedrons combine with graphene oxide has no effect on Fe 2 O 3 and the oxide phase structure and crystallinity. 24.0 °, 33.0 °, 35.5 °, 40.7 °, 49.3 °, 54.0 °, 57.6 °, 62.3 °, 63.9 °, 71.8 °, and 75.3 ° respectively and -Fe 2 O 3 Nocturnal crystalline planes of polyhedrons. [31] Texture Analyzer (SWICK) on images stored in desiccators with previous drag tests mechanical properties of various materials are evaluated. At 20 ° C and 55% RH (in MgNO3 saturated saline solution). For that purpose, the samples were stamped on the form of a dog bone (4 mm wide and 45 b) and Youngs modulus (E) b). Nominal strain mm cage length). During the break. The nominal pressure during the break (determined from the pressure-strain curves. The force of fracture, calculated as the function of the length (in mm) under the force curve (in N) from the total area, is 45 mm and 10 mm per minute, respectively. [30] Obviously, the processing properties and geometric Features of ND, namely the shape, size and volume distribution of the primary particles and aggregates, as well as its intrinsic surface and aggregate properties. These features compile NDs because they are closely related to the methods used to link NDs in both laboratory and large business measurements and the structure and properties of NDs. A brief overview of the different methods of production This section aims to provide an overview. . Contains. Many excellent review articles are books and considering the book chapters, this section attempts to present only general features that are useful in better understanding the processing and characteristics of NDs. PNDs. compounds. [37] The The neighboring epoxy, MD model was separated using concentrated cylinders centered on the CNT axis. The mass of each cylindrical shell area Density was determined. For each sample, 250 instantaneous times were considered as 100 PS NPT simulations. Density profiles 250 snapshots One density profile for each of the three epoxy systems Density was estimated to obtain. Figure 3 (a) and (b) show the density profiles the equilibrium anchor attached models and the cross-linked models, respectively. Spike density is about the same as carbon atoms at 4 CNT. CNT atoms airs over epoxy Derwalls transmit power uniformly, the extracted part being the unique link between CNT and epoxy. Creating spaces. As a result, the epoxy atoms are approx Have radiation gaps of 6 and higher. From about 7-8.5, the local density is higher than the total Epoxy (1.2 g / cm³). Moving further from CNT, Surrounded by epoxy density total density, gradually decreasing the range. [28] In electrochemistry, the design of new electrochemical sensors / biosensors can This can be achieved by changing the surface of the electrode with different types hybrids with desirable analysis and electrochemical properties (prefabricated / medium-carbon molecules, functional graphene and Au-based) [60] hybrid material-modified Were used as common environmental sensitivities or bio sensing systems to monitor pollution.

Polymer Composites

[53] As a result, a series of four catalysts (used for H, / CO Fischer Tropsch reactions) were produced at the same support (y-Fe, O.). They are described in Table 11. Fe, O,] Ni] Co] Cu was formed by the addition of copper to cobalt over nickel over Fe, O. Fe, O,] Ni / Cu] Co (No. 3, Table 11).) Was produced by the addition of nickel on Fe, O, followed by the subtraction of copper on nickel and finally by the addition of cobalt. Fe, O,] Ni / Cu are formed by the addition of nickel on Fe, O followed by the subtraction of copper. [30] This research article is based on recent achievements in the field of PND compounds that emphasize the process-structure-property relationship. Accordingly, the structural and intrinsic properties of ND are commercially reasonable Are first evaluated based on their ability to generate multifunctional PND. Current achievements in surface transformation, especially those targeting only PNDs, have been reviewed to date Have been provided. Different processing methods are offered. Detecting ND performance, morphology and effects of polymer / ND interface Emphasis is given. Intermediate and processing conditions of various polymers currently being studied, mechanical, thermal, abrasive, chemical properties and biocompatibility. Subsequently, the various applications of PNDs are divided into structured and functional applications, and the manuscript is reviewed. Approved. Multifunctional PND is first evaluated based on its creativity. Current achievements of surface change, in particular Of ND in the formation of polymer compounds, targeting only the PNDs reviewed to date possible capabilities are discussed and future challenges and opportunities are presented in this mix. [36] Polymer inkjet Printing and Direct-right Extrusion Based Technology-4 is a powerful alternative For the 5 conventional technique mentioned. Other inkjet printing techniques in 6, low-viscosity solutions Or polymer suspensions 7 are used for printing. Material. 10 layer-by-layer style. 11 [42] One layer after printing, the surface of a leveling cylinder is leveled, which solidifies when cured under UV 12 light. Uses Photo-13 polymers Like other printing techniques the addition of non-abrasive resin has a viscosity and curing rate. 14 and the resulting printed 15It can also affect the quality of parts. [47] SMPs are considered to have net points and molecular switches. Net points can be formed by covalent bonds or molecular interactions. So, they are Chemical or physical in nature. Chemical structure Cross-linked SMPs, referred to as r moseys, are the appropriate cross-link Can be achieved by chemistry. Physically cross-linked refers to at least two separate thermoplastics, required Polymer morphology with domains. The network chains of SMPs can be amorphous or crystalline, so the change temperature is the glass change temperature or melting temperature. (DM) [18] Asbestos graphite interferometric alloy provided (GIC, Asbury 3494). Carbons, Asbury, NJ, USA. (THF), 1-methyl-2-pyrrolidone 99% (NMP), 4, 40-diamond (DDS) and (TIPA) were purchased

from Sigma Aldrich. Amin was used by Huntsman as a hardener (DGPEPA, CIPA-Epoxy, equivalent, purchased from Australia) Figure 1 contains the molecular formulas of DTS and DGPEPA. [23] Epoxy resin suspensions with loads of 0.5, 1.0, 1.5, 2.0, 2.5 wt% were made of g-PS and 0.5 wt% loading pure PS powders. The powders in this work are not imaginary). G-PS and Pure PS powders both stay moist at night without any interference with the epoxy resin. One hour suspension (600 rpm, D2004W, Shanghai Mei Ying Instrument and Mei Ying Instrument and Mir Manufacturing Co. Ltd.) 25 °C. and electrical properties to be considered. Although the modulus of flexibility is slightly increased with the metal fiber contents, it is significantly different in different materials as shown in Figure 4fDoes Is different. In addition, the tensile strength does not differ significantly with the variation of the metal fiber content based on the test results. However, EMI SE and attack strength show significant variation with metallic fiber contents. D.

Carbon Fiber

Their carbon number follows the linear trend of the Co / mesoH-ZSM-5 representative for ASF distribution. On the contrary, the hydrocarbon distribution in Co / mesoH-ZSM-5 (w) does not follow this linear trend. ASF distribution is roughly broken down into C13 molar fractions of most hydrocarbons are significantly reduced. These mesoH-ZSM-5 (w) results clearly show that, according to the literature, olefin hydrocarbons formed near acid bases and co bases, i.e. cracking and modernization, are promoted. [58] The Analysis of the results given, whether the concentration of the hardener is equal to or less than a stoichiometric When lower, the increase in glass conversion temperature in nanocomposite is greater than the initial event Lets decide that goes faster. Adhesive. However, at higher hardening, nanocomposite the glass change temperature appears to be lower than the glass change temperature in the initial setting. Based on the analysis of literature data and given dependencies can be concluded that the epoxy compounds with CNDs lead to an increase in the magnitude of the change when not sufficiently curable (lack of sufficiently high temperature and hardening). Chemical cross-linking to develop the most conventional network and thus glass-changing temperature development. When complete change is achieved, the. [62] Fiber / size compatibility This is an important factor in the final measurement fiber / matrix interface adhesion. However, in some cases the scattering of the measuring material in the polymer matrix has less impact or their compatibility. May contain. Causing improved interface strength depending. From time to time, the measuring functional groups are absorbed into the fiber surface, preventing it from dissolving in the polymer matrix during composite production and Creates a weak fiber / matrix interface. The size growth of the fibers is a complex system. For example, commercially available sizes for CF polyamide sizes are highly compatible with epoxy. Measurement application for CF improves its abrasion resistance and bending strength. This reduces the CF compatibility with the polymer matrix. Research to calculate binding agents for CF coatings to improve fiber / matrix adhesion at an important stage [63] ACFs are used in a variety of absorption units. One of them is the corrugated paper spinning unit shown in Figure 1. Another A molding technique to obtain the optimal configuration of the suction blocks for optimal contact between the ACF and the flowing fluid of the reliable type Is to use. The most common use is fiber packed beds. In ACF filled beds, there is no control of absorption kinetics internal particle diffusion, but the axial distribution in the fiber-filled beds. The axis scatter coefficient in fiber beds is interrelated [64] During production the fibers are made by surface treatment with Thermosetting (epoxy, polyester, phenolic, polyamide resins) or Thermoplastic (polypropylene, nylon 6.6, PMMA, PEEK) polymer matrix. The fiber surface a is a It is hardened with a chemical coating and then used to facilitate bonding with specific matrix. Collaboration The most important of the strengths are the properties of fiber. The function of the matrix is to support the fibers and to the aircraft Is to provide strength on the outside, regardless of function being equal in many situations. The purpose of material suppliers is to set up a system standard properties. [65] Carbon annotates water using a We found that the DC potential scattering between the carbon fiber and the opposite electrodes, the carbon fiber is uniformly deposited on the surface. Due to the negative charge, the carbon positive carbon fiber electrode moving towards, which is nitric acid. The fiber is placed on the surface during treatment. Dispersion of pineapples in hydroxyl contributes to net negative charge. In the first group of experiments, 5 Epoxy samples with mole% catalyst (for details) were used in the test area. See) their weights were immersed in 3 G EG solvents and measured at different time points. EG evaporates to prevent, close the container when placed at high temperature. Figure 1c at 180 °C in EG, the average weight of the epoxy samples as a function of the soaking time (normalized by the initial weight of the epoxy).

Environmental Applications

[27] Because MWCNTs are chemically reactive the interaction between annotates is significantly enhanced and the The Production of Active MWCNTs are made of interconnected and perforated polymer composites. Improved chemical properties, especially bonding as mentioned in heat treatment MWCNT / PP compound Is believed to be growing. Therefore, heat treatment MWCNT / PP compounds exhibit good scattering and unique chemical behavior in dynamic oscillating flow. strength. interface contact. [61] Open porosity and density were measured by the Archimedes method. The morphology was observed with a scanning electron microscope (SEM, S4700; Hitachi, Japan). Laser flash mode (LFA 427, NETZSCH and Germany) using X-ray diffraction Cu K α ($\lambda = 1.54$) radiation combination (XRD, max-2400; Tokyo, Japan) Used to measure heat dissipation (ρ) and heat capacity (C_p). Thermal conductivity (κ) is calculated by the following equation: $\kappa = C_p \rho$, which is the density of the sample. High Resistor meter (4339B, Agilent, USA) conducted to measure direct current electrical resistance. [13] After the CFs were oxidized by the plasma mechanism and reduced by LiAlH₄ treatment, changes in their surface organ contents were made by XPS. Figure 2 Provides wide-scan XPS spectra of

original, oxidized and reduced CFs. Composition and contents of CF surfaces Table I Listed. On the surface of oxidized CF, the concentration of oxygen is significantly higher compared to untreated CF at the same time. The concentration of carbon decreases significantly as shown in Figure 2 and Table I. The results show an increase in the O: C ratio from 0.118 to 0.251. [41] Micro structural imaging of 4D printed models using the Scanco μ CT35 scanner (Skanko Medical, Switzerland). X-ray voltage and current were set to 70 kV and 57 A, respectively. Scanning resolution is approximately 18.5 μ m / pixel. To reduce micro-CD imaging time, the length of the printed specimens was reduced to approximately 15 mm, and the length of the post-cure specimens was reduced to approximately 18 mm to observe failure. Changed the brightness and contrast of 2D images obtained using CT vox software. 3D model reconstruction and cross-section using CT vox software. [43] First, six different dyes were selected to test the absorption performance of PPY, PPY-CS, PPY-LS and PPY-CS-LS, namely ethylene blue (MB), malachite green (MG), amaranth (AM) and acid. Orange. . 10 (AO10), Congo red (CR), and acid blue74 (AB74). Shows positive charge in MB and MG solutions containing casein dyes; CR, AM, AO10 and AB74 have negative charges in solution containing ionic dyes. Show. For volume studies, 60 mg L⁻¹ was added to 25 ml (MB, MG, CR, AM, AO10Or AB74) dye solution. Mg power sample (PPY, PPY-CS, PPY-LS or PPY-CS-LS).) After reaching equilibrium, the absorption-solution was passed through a filter and the equilibrium concentration of the dye was analyzed. Different carry 50 UV-visible spectrophotometer. Then, absorption kinetics, isothermal and thermal kinetics, according to the absorption efficiency and properties. [60] Determination of enzyme activity: Chromospheres from AAPF-NA measure Absorption at 405 nm using SC function and initial ratios HTS7000 plus Obtained by measuring the increase by monitoring the release of b-nitro aniline in polymeric films. Bio Assay Reader. Blue was used as the substrate for and was initially measured At 610 nm using a UV-2401PC spectrophotometer. Measured. Rates are derived from Scientific Instruments, Columbia, MD). A common for evaluation, SC or compost containing films immersed in a 100-mm solution of phosphate buffer (50 mm, pH 7.0). [14] The epoxy resin used in this study Compound EPO 1441-30 Resin, an acid. Penicillin is an anhydride curing agent and a 100: 70: 1 amine accelerator. In terms of weight. All of these elements are shell Issued by Chemical Corporation. The texts used in Article 1K are high-strength carbon fibers supplied by China's carbon factory.

Thermal Conductivity

[35] Unless the simulation results are specified, two-level simulations were made in this study. First At this point, only the localization of the DBD is allowed to receive the distribution of RA, DDS and SA. Prior to diffusion simulation, the RA and DDS molecules were in the adhesive phase (24–144 nm) and the SA molecules in the size layer (0–24 nm, fiber). Near the surface) were only.. Alternative amount of epoxide 80% Cross-linking reactions are allowed until reached. [39] the first phase, only DPD localization was allowed to receive Distribution of RA, DDS and SA. Prior to diffusion simulation, the RA and DDS molecules were adhesive Phase (24-144 nm) and SA molecules were in the size layer (0-24 nm, fiber). Were only near the surface. In the second stage, the distribution is the same Cross-linking reactions were activated with improvement over time. Alternative amount of peroxide 80% Cross-linking reactions are allowed until reached. [5] Recently, The suspension of GO sheets and BN platelets was treated with water heat to form RGO / BN hybrid followed by air. Drying. 44 wt% high RGO / BN load.0 11.01 W m⁻¹2000 Epoxy and through-plane thermal conductivity K-1. Of anisotropic hole structures Graphene (GNPs) currently work with high quality modifying BN platelets to further improve thermal conductivity Are selected. First, vertically aligned RGO / GNP hybrid are formed by combining the water suspension of GO. GNP with water heat. then air-drying. [52] We have demonstrated that the spatial distribution and orientation of grapheme, which acts magnetically on the polymer, is geometrically controllable. The Matrix makes it easy and efficient to design and develop graphene-based active compounds. Possible high-scaling path. The design possibilities offered by grapheme magnetic manipulation reflect the excellent flexibility in the design of virtual magnetic axes, which are highly efficient. And allows to create complex shapes with minimal effort. [7] For each type of structure mentioned earlier, there are different ways to change the morphology of the resulting microstructure. Chemical composition, solidification Simple binary conversion to different configuration types can be achieved from the rate or processing method phase diagram. In general, with solid warning reactions Areas around unchanged points, such as associated eutectic or pericardial points, act as morphological indicators. Various microstructures. [2] Diagram can achieve different configuration types. Generally, eutectic or pericardial Areas around unchanged points associated with solid warning reactions, such as dots, act as morphological indicators for various microstructures.

Conclusion

Analysis of the results given, when the concentration of the hardener is equal to or less than a stoichiometric, glass in nano composite This allows us to conclude that the increase in conversion temperature goes faster than the initial resin. However, at higher hardening, nano composite The glass change temperature appears to be lower than the glass change temperature in the initial setting. Based on the analysis of literature data and given dependencies it can be concluded that the epoxy compounds with CNDs lead to an increase in the magnitude of the change when not sufficiently curable (lack of sufficiently high temperature and hardening). Chemical cross-linking to develop the most conventional network and thus glass-changing temperature development. When complete change is achieved, the. Carbon nano tubes water using In a DC capacity annotate scattering between carbon fiber and opposite electrodes From that we found that the carbon fiber was uniformly deposited on the surface. Carbon annotates, due to negative charge The positive carbon fiber moves towards the electrode, which is deposited on the fiber surface during nitric acid treatment, the negative charge of the carboxylic acid

groups introduced into the annotates 7, 8 and absorption. . Hydroxyl anions can contribute to net negative charge from scattering.1 To analyze the influence of CNT on neighboring epoxy, the MD sample was separated using concentrated cylinders centered on the CNT axis. The mass density of each cylindrical shell area Determined. For each sample, 250 instantaneous 100 PS NPT simulations were considered. Density profiles of 250 snapshots Density for each of the three rated epoxy systems Is the average for obtaining a profile. Figure 3 (a) and (b) show the densities of the equilibrium anchor attached models and the cross-linked models, respectively. Showing profiles. Spike density at about 4 Similar to the carbon atoms in CNT. The CNT atoms uniformly exert the forces of Van Mann Walls on the epoxy, the part extracted from it forming a distinct gap between the CNT and the epoxy. Morphology Al₂O₃ @ HGO hybrid, shown in Figure 2a-d, provides some visual evidence for the HGO coating. In Figure 2a, the primitive Al₂O₃ particles reveal A typical spherical shape with an approximate area and average size of 5 mm. Because the HGO coating transitions from a rough state to a smooth surface is high There are some links between adjacent Al₂O₃ particles with a number of HGO coating layers (Figure 2b). High magnification SEM (Figure 2c) and TEM images (Figure 2d) reveal that the surface of the Al₂O₃ particles is covered with a small HGO coating layer. Polymer Inkjet Printing and Direct- Writing output based technology-4 is a powerful alternative to the conventional techniques mentioned above. Other inkjet printing techniques in 6Unlike, low-viscosity solutions or polymer suspensions are used as 7 prints. Material. In Figure 2a, the primitive Al₂O₃ particles reveal A typical spherical shape with an approximate area and average size of 5 mm. HGO coating in a rough condition Smooth from, because of the high number of HGO coating layers changes on the surface There are some links between Al₂O₃ particles (Figure 2b). High magnification SEM (Figure 2c) and TEM images (Figure 2d) reveal that the The surface of the Al₂O₃ particles is covered with a small HGO coating layer. Polymer Inkjet Printing and Direct- Writing output based technology-4 is an alternative to the usual techniques mentioned above. Unlike other inkjet printing techniques in 6, low-viscosity solutions or polymer suspensions are used for 7 printing. Material.

Reference

1. Valero-Romero, M. J., S. Sartipi, X. Sun, J. Rodríguez-Mirasol, T. Cordero, F. Kapteijn, and Jorge Gascon. "Carbon/H-ZSM-5 composites as supports for bi-functional Fischer–Tropsch synthesis catalysts." *Catalysis Science & Technology* 6, no. 8 (2016): 2633-2646.
2. Kablov, E. N., S. V. Kondrashov, and G. Yu Yurkov. "Prospects of using carbonaceous nanoparticles in binders for polymer composites." *Nanotechnologies in Russia* 8, no. 3 (2013): 163-185.
3. Sharma, Mohit, Shanglin Gao, Edith Mäder, Himani Sharma, Leong Yew Wei, and Jayashree Bijwe. "Carbon fiber surfaces and composite interphases." *Composites Science and Technology* 102 (2014): 35-50.
4. Suzuki, Motoyuki. "Activated carbon fiber: fundamentals and applications." *Carbon* 32, no. 4 (1994): 577-586.
5. Soutis, Costas. "Carbon fiber reinforced plastics in aircraft construction." *Materials Science and Engineering: A* 412, no. 1-2 (2005): 171-176.
6. Mei, Lei, Yibin Li, Rongguo Wang, Chao Wang, Qingyu Peng, and Xiaodong He. "Multiscale carbon nanotube-carbon fiber reinforcement for advanced epoxy composites with high interfacial strength." *Polymers and Polymer Composites* 19, no. 2-3 (2011): 107-112.
7. Yu, Kai, Qian Shi, Martin L. Dunn, Tiejun Wang, and H. Jerry Qi. "Carbon fiber reinforced thermoset composite with near 100% recyclability." *Advanced functional materials* 26, no. 33 (2016): 6098-6106.
8. Liu, Shaoxiong, Lingxia Zheng, Pingping Yu, Sancang Han, and Xiaosheng Fang. "Novel composites of α -Fe₂O₃ tetrakaidecahedron and graphene oxide as an effective photoelectrode with enhanced photocurrent performances." *Advanced Functional Materials* 26, no. 19 (2016): 3331-3339.
9. Baeza, Francisco Javier, Oscar Galao, Emilio Zornoza, and Pedro Garcés. "Multifunctional cement composites strain and damage sensors applied on reinforced concrete (RC) structural elements." *Materials* 6, no. 3 (2013): 841-855.
10. Gao, Xuran, Bingbing Wang, Kuikui Wang, Shuang Xu, Sipeng Liu, Xuehua Liu, Zirui Jia, and Guanglei Wu. "Design of Ti₃C₂T_x/TiO₂/PANI multi-layer composites for excellent electromagnetic wave absorption performance." *Journal of Colloid and Interface Science* 583 (2021): 510-521.
11. Berthet, M-A., H. Angellier-Coussy, Vorleak Chea, Valérie Guillard, Emmanuelle Gastaldi, and Nathalie Gontard. "Sustainable food packaging: Valorising wheat straw fibres for tuning PHBV-based composites properties." *Composites Part A: Applied Science and Manufacturing* 72 (2015): 139-147.
12. Karami, Pooria, Samaneh Salkhi Khasraghi, Mohammadjafar Hashemi, Sima Rabiei, and Akbar Shojaei. "Polymer/nanodiamond composites-a comprehensive review from synthesis and fabrication to properties and applications." *Advances in colloid and interface science* 269 (2019): 122-151.
13. Radue, M. S., and Gregory M. Odegard. "Multiscale modeling of carbon fiber/carbon nanotube/epoxy hybrid composites: Comparison of epoxy matrices." *Composites Science and Technology* 166 (2018): 20-26.

14. Kempahanumakkagari, Sureshkumar, Kowsalya Vellingiri, Akash Deep, Eilhann E. Kwon, Nanthi Bolan, and Ki-Hyun Kim. "Metal-organic framework composites as electrocatalysts for electrochemical sensing applications." *Coordination Chemistry Reviews* 357 (2018): 105-129.
15. Lee, Seung Hwan, EunNaRi Cho, So Hee Jeon, and Jae Ryouun Youn. "Rheological and electrical properties of polypropylene composites containing functionalized multi-walled carbon nanotubes and compatibilizers." *Carbon* 45, no. 14 (2007): 2810-2822.
16. Song, Chaokun, Yongsheng Liu, Fang Ye, Laifei Cheng, Pengfei Zhang, and Nan Chai. "Enhanced mechanical property and tunable dielectric property of SiCf/SiC-SiBCN composites by CVI combined with PIP." *Journal of Advanced Ceramics* 10, no. 4 (2021): 758-767.
17. He, J. M., and Y. D. Huang. "Effect of silane-coupling agents on interfacial properties of CF/PI composites." *Journal of applied polymer science* 106, no. 4 (2007): 2231-2237.
18. Liu, Yang, Wei Zhang, Fenghua Zhang, Jinsong Leng, Shaopeng Pei, Liyun Wang, Xinqiao Jia, Chase Cotton, Baozhong Sun, and Tsu-Wei Chou. "Microstructural design for enhanced shape memory behavior of 4D printed composites based on carbon nanotube/polylactic acid filament." *Composites Science and Technology* 181 (2019): 107692.
19. Zhou, Jing, Qiu-Feng Lü, and Jia-Jia Luo. "Efficient removal of organic dyes from aqueous solution by rapid adsorption onto polypyrrole-based composites." *Journal of cleaner production* 167 (2017): 739-748.
20. Asuri, Prashanth, Sandeep S. Karajanagi, Ravi S. Kane, and Jonathan S. Dordick. "Polymer-nanotube-enzyme composites as active antifouling films." *Small* 3, no. 1 (2007): 50-53.
21. He, Jinmei, Yudong Huang, Linghui Meng, Hailin Cao, and Hongbo Gu. "Effects of chain lengths, molecular orientation, and functional groups of thiols adsorbed onto CF surface on interfacial properties of CF/epoxy composites." *Journal of applied polymer science* 112, no. 6 (2009): 3380-3387.
22. Warshawsky, A., D. A. Upson, W. T. Ferrar, and J. R. Monnier. "Zerovalent metal polymer composites. III. Metallization of metal oxide surfaces with the aid of metallized functional polymer microdispersions." *Journal of Polymer Science Part A: Polymer Chemistry* 27, no. 9 (1989): 3015-3041.
23. Karami, Pooria, Samaneh Salkhi Khasraghi, Mohammadjafar Hashemi, Sima Rabiei, and Akbar Shojaei. "Polymer/nanodiamond composites-a comprehensive review from synthesis and fabrication to properties and applications." *Advances in colloid and interface science* 269 (2019): 122-151.
24. Dermanaki Farahani, Rouhollah, and Martine Dubé. "Printing polymer nanocomposites and composites in three dimensions." *Advanced Engineering Materials* 20, no. 2 (2018): 1700539.
25. Leng, Jinsong, Xin Lan, Yanju Liu, and Shanyi Du. "Shape-memory polymers and their composites: stimulus methods and applications." *Progress in Materials Science* 56, no. 7 (2011): 1077-1135.
26. Ma, Jun, Qingshi Meng, Andrew Micheltmore, Nobuyuki Kawashima, Zaman Izzuddin, Carl Bengtsson, and Hsu-Chiang Kuan. "Covalently bonded interfaces for polymer/graphene composites." *Journal of Materials Chemistry A* 1, no. 13 (2013): 4255-4264.
27. Ma, Chao, and Hongbo Gu. "Low Loading of Grafted Thermoplastic Polystyrene Strengthened and Toughened Transparent Epoxy Composites." In 2017 AIChE Annual Meeting. AIChE, 2017.
28. Jeon, Seong Ho, Heon Mo Kim, Tae-Hong Park, Byoung-Ho Chi, and Woo Chun Choi. "Development of polycarbonate/acrylonitrile-butadiene-styrene copolymer based composites with functional fillers for car audio chassis." *Materials & Design* 32, no. 3 (2011): 1306-1314.
29. Li, Min, Yi-Zhuo Gu, Hong Liu, Yan-Xia Li, Shao-Kai Wang, Qing Wu, and Zuo-Guang Zhang. "Investigation the interphase formation process of carbon fiber/epoxy composites using a multiscale simulation method." *Composites science and technology* 86 (2013): 117-121.
30. Feng, Yuezhan, Chengen He, Yingfeng Wen, Xingping Zhou, Xiaolin Xie, Yunsheng Ye, and Yiu-Wing Mai. "Multi-functional interface tailoring for enhancing thermal conductivity, flame retardancy and dynamic mechanical property of epoxy/Al₂O₃ composites." *Composites Science and Technology* 160 (2018): 42-49.
31. Feng, Yuezhan, Chengen He, Yingfeng Wen, Xingping Zhou, Xiaolin Xie, Yunsheng Ye, and Yiu-Wing Mai. "Multi-functional interface tailoring for enhancing thermal conductivity, flame retardancy and dynamic mechanical property of epoxy/Al₂O₃ composites." *Composites Science and Technology* 160 (2018): 42-49.
32. An, Fei, Xiaofeng Li, Peng Min, Pengfei Liu, Zhi-Guo Jiang, and Zhong-Zhen Yu. "Vertically aligned high-quality graphene foams for anisotropically conductive polymer composites with ultrahigh through-plane thermal conductivities." *ACS applied materials & interfaces* 10, no. 20 (2018): 17383-17392.
33. Le Ferrand, Hortense, Sreenath Bolisetty, Ahmet F. Devisors, Rafael Libanori, André R. Studart, and Raffaele Mezzenga. "Magnetic assembly of transparent and conducting graphene-based functional composites." *Nature communications* 7, no. 1 (2016): 1-9.

34. Heinz, Nicholas A., Teruyuki Ikeda, Yanzhong Pei, and G. Jeffrey Snyder. "Applying quantitative microstructure control in advanced functional composites." *Advanced Functional Materials* 24, no. 15 (2014): 2135-2153.
35. Li, Qingxiu, and Laurent M. Matuana. "Effectiveness of maleated and acrylic acid-functionalized polyolefin coupling agents for HDPE-wood-flour composites." *Journal of Thermoplastic Composite Materials* 16, no. 6 (2003): 551-564.
36. Dr. Amol Lokhande, Dr. C. Venkateswaran, Dr. M. Ramachandran, S. Chinnasami, T. Vennila, A Review on Various Implications on Re engineering in Manufacturing, *REST Journal on Emerging trends in Modelling and Manufacturing* Vol: 7(3), 2021,70-75.
37. Dr. Amol Lokhande, Dr. C. Venkateswaran, Dr. M. Ramachandran, C. Vidhya, R. Kurinjmalar, A Study on Various Implications on Reusing in Manufacturing, *REST Journal on Emerging trends in Modelling and Manufacturing* 7(2) 2021, 63-69
38. Gadde Mehar Chaitanya, M.P.Jenarthanan, C. Sathiyaraj, A Review on Glass fibre Reinforced Composites with Different Matrix, *REST Journal on Emerging trends in Modelling and Manufacturing* 7(1) 2021, 18-24.
39. Allahkarami, Zeynab, Ahmad Reza Sayadi, and Amol Lanke. "Reliability analysis of motor system of dump truck for maintenance management." In *Current trends in reliability, availability, maintainability and safety*, pp. 681-688. Springer, Cham, 2016.
40. Lanke, Amol Arun, Seyed Hadi Hoseinie, and Behzad Ghodrati. "Mine production index (MPI)-extension of OEE for bottleneck detection in mining." *International Journal of Mining Science and Technology* 26, no. 5 (2016): 753-760.
41. Lanke, Amol, Hadi Hoseinie, and Behzad Ghodrati. "Mine production index (MPI): new method to evaluate effectiveness of mining machinery." *Int. J. Environ. Chem. Ecol. Geol. Geophys. Eng* 8 (2014): 714-718.
42. Ramachandran, M., Sahas Bansal, and Pramod Raichurkar. "Experimental study of bamboo using banana and linen fibre reinforced polymeric composites." *Perspectives in Science* 8 (2016): 313-316.
43. Raichurkar, Pramod, and M. Ramachandran. "Recent trends and developments in textile industry in India." *International Journal on Textile Engineering & Processes* 1, no. 4 (2015): 47-50.
44. Chidambaram, P. K., and R. Ramakrishnan. "Manufacturing, testing of polymer nanocomposite and analysis of tennis racket frame." *International Journal of Engineering and Technology Innovation* 4, no. 1 (2014): 59.
45. Chidambaram, P. K., and R. Ramakrishnan Impact. "String Tension and Vibration Analysis of Nanocomposite Based Tennis Racket Frame." *Scholars Journal of Engineering and Technology* (2014): 206-211.
46. Chidambaram, P. K., K. Thamilarasan, J. Barath Kumar, and L. Auxilia Mary. "A review on turbines in power production using wind and hydro energy." *Materials Today: Proceedings* (2021).
47. Jayapriya, J., D. Muruganandam, M. Shantharaj, S. Thayumanavan, S. Suraj, and P. K. Chidabaram. "Design and analysis of glass fiber reinforced composites." *Materials Today: Proceedings* 26 (2020): 2491-2494.
48. Chidambaram, P. K. "Synthesis, Testing of Polymer Carbon Nanocomposite and Structural Analysis of Tennis Racket Frame." *International Journal of Engineering Sciences & Research Technology* 2, no. 10 (2013).
49. Chidambaram, P. K., and R. Ramakrishnan. "Mechanical properties and Morphological analysis of nylon6, 6/cloisite@ 20A Nanocomposite." *National Journal on Advances in Building Sciences and Mechanics* 3 (2012): 8-13.
50. Rajaperumal, C. Vengatesha, P. K. Chidambaram, M. Arputha Bibiana, and G. Arun. "Development of Dual purpose manual weeder." *Materials Today: Proceedings* (2021).
51. Thamilarasan, K., P. K. Chidambaram, A. Ponshanmugakumar, and V. Bharani. "Design and Automation of degreasing of oil from strained materials." *Materials Today: Proceedings* (2021).
52. Srividhya, K., P. K. Chidambaram, A. Sivasakthi, and P. Dharanidharan. "Pre concentration and analysis of trace quantities of heavy metals using coirpith." *Materials Today: Proceedings* (2021).
53. Chidambaram, P. K., S. JohnDaniel, and M. Ganesh Kumar. "Morphological Analysis of the Nylon6, 6 Matrix based Clay and Carbon Nano composites." *Materials Today: Proceedings* 16 (2019): 1344-1349.