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Discussion on an Overview of Graphene Nanocomposites and Dielectric Elastomers

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ABSTRACT

This article examines the most current advancements in dielectric elastomer actuator technology. The adaptability of these actuators makes them helpful in a wide range of situations. Dielectric elastomers, a kind of electroactive polymer, undergo a transformation when subjected to an electric field. When compared to piezoelectric materials, shape memory alloys, ionic polymer metallic materials, and form memory alloys, EAPs' applicability for the design of a broad range of sensors, actuators, and biomedical equipment is better. Because EAPs are able to preserve their original shape even after being distorted, this is why they are so effective. Since EAPs are light, adaptable, simple to manufacture, economically viable, and compatible with surfaces and geometries of varying complexity, this is the case. Shape-memory alloys and materials with piezoelectric characteristics are also included. The working electric field is rather intense, and the dielectric constant is quite low, making this material challenging to deal with. This is the most significant stumbling block in the process of dealing with this particular substance. One way to deal with this problem is to use filler materials that are extremely conductive, such as graphene oxide (GO), reduced graphene oxide (RGO), or functionalized graphene oxide. Functionalized graphene oxide and reduced graphene oxide are other possible techniques. In addition to functionalized graphene oxide and reduced graphene oxide, there are two more ways that might be used. A lot of choices are now at your disposal, including this one. Actuators that rely on this material may now be built since EAPs composites have been created with a typical low operating voltage (on the request for 50 V/m). To put it another way, we can now design actuators that are reliant on this material. These materials are used as actuators in many different types of control, adaptable, and automated systems, including many different academic areas, such as science, electromechanics, and others. [For instance:] There are several examples of this, such as: [As an illustration:] ... [Here's a great example of] There are a number of issues related with the usage of electroactive polymers (EAPs) in this study, which was focused on the operating principle and actuation mechanism.

Keywords: *Solar Panel; Pulse Width Modulation (PWM); Shoot-through; Voltage Source Inverter (VSI); Boost Derived Hybrid Converters (BDHC).*

1.0 Introduction

The creation of fibre actuators based on polymers that, when subjected to an electric field, are capable of converting in terms of their shape, size, volume, or other factors [1]. The actuator fibre has a natural tendency to be employed as a building block for a wide range of unique products,

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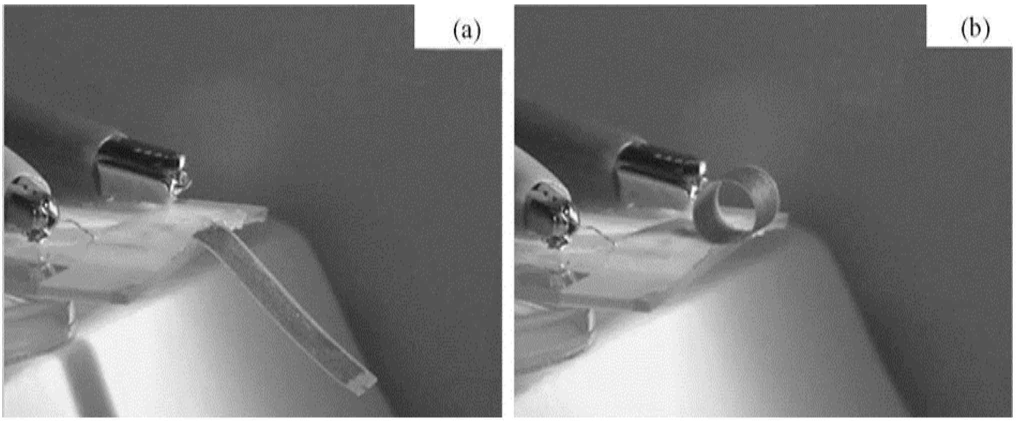
ranging from clinical prostheses to astute material structures. This use has been more common in recent years. Dielectric elastomers provide the greatest amount of confidence and performance characteristics that are the most comparable to those of genuine muscles in a number of different domains. In order to put together these fibres, thermoplastic DEs will be used as the actuator material for the fiber-framing, and a multi-portion fibre game plan will be established. Both of these steps will take place in sequence. The assessment of the enlarged constrained segment will be finished so that the actuator fibre structure can be improved and so that we can understand the impact of the helper parameters and the material parameters. Both of these goals are important. [2] [1]. At least one of the components of polymer nanocomposites, the filler, exists on the nanoscale scale. Polymer nanocomposites are two-stage materials. 'Polymer nanocomposites' It is possible to classify nanofillers into one of these three groups. The first kind is the nanoparticles, which are distinguished by the fact that all three of their dimensions are on the nanometer scale. Examples of nanoparticles include semiconductors, metal nanoparticles, colloidal scattering of polymers, and many more, as shown in figure no. 1. [3] [4] [5].

Figure 1: The following is a description of the presentation of a unimorph that consists of one layer of electro-strictive P(VDF-TrFE) copolymer that is 21 millimetres thick and is linked to an inactive polymer that is of a comparable thickness: (a) the image shows the unimorph when there is no electric field present; (b) the picture shows the unimorph becoming excited when there is an electric field present that has a strength of 66 MV/m (Bar-Cohen, 2005).



Second, there are nanomaterials that are two-dimensional, in which case there are two components of the filler that are on the nanoscale. The models are made up of nano cylinders and cellulose bristles that are each one dimension bigger than the two dimensions that came before them, and as a result, they build extended structures [6] [7]. -The platelet-formed nano muds that have one measurement in the nanoscale are a part of the third assortment of items. It's possible that the nanocomposites that fall into this category may be called the polymer/mud nanocomposites. Dirt- and mineral-based nanocomposites are now the focus of a significant amount of research due to the abundance of natural qualities, cheap manufacturing costs, high mechanical quality, and effective resistance to chemical reactions that these nanocomposites possess. The scientific concepts that underlie the intercalation of polymer and earth have been researched to a great extent. [8] [9]. According to the findings of the research, Kojima and his colleagues initially appeared to demonstrate for nylon that "the dispersion of the nanosized particles in the polymer grid leads in tremendously superior mechanical, thermal, optical, and physico-compound characteristics when compared with immaculate polymer." [10]. Polymers have been known about and researched for a very long time. These polymers may change their shape or size in response to changes in the environment they are in. They have a reaction whenever they are subjected to stimuli such as a rise in pH, an attracting field, an electrical field, or light. It's possible that the name "Dynamic Polymers" may be used to refer to this collection of dynamic polymers as a group. Polymers and combinations of polymers are becoming more popular as "materials" in our day and age [11]. Numerous novel polymer-based inventive material advancements, collectively referred to as "Savvy Materials," are now capable of independent response to shifting environmental changes thanks to the incorporation of detecting and reaction capabilities. These materials are collectively referred to as "Savvy Materials." In the most recent ten years, a fresh classification of materials known as electroactive polymers (EAP) has come into existence. These materials react to an external electrical stimulation by demonstrating a considerable decrease in either their size or their shape, depending on which one is being stimulated. Electronically Activated Particles (EAPs) react owing to electro-static or Coulomb powers, and ionic polymer-metal composites (IPMC). This kind of material also goes by the term dielectric elastomers in certain circles. Electronic EAPs have several qualities with their ionic analogues, which are also known as electronic elastomer-based active polymers (EAPs), have been shown to have the characteristics that hold the greatest promise. Dielectric polymers, also known as D-EAPs, have a performance that is superior to that of other kinds of EAPs in terms of their incitation strain, reaction time, high vitality thickness, and high efficiency. This is the case in all four of these categories. Acrylic elastomer is well-known for being the most popular material because it has the greatest areal incitation strain (160 percent), the most flexible vitality thickness (3.4 MJ/m3), and the highest weight. These properties contribute to the fact that acrylic elastomer is the most popular material (7 MPa). On the other hand, almost all of the D-EAPs that have been discovered up to this time are homopolymers that have a structure that can be deduced. Acrylic, silicone, and polyurethane are a few examples of materials that fall within this category. When compared to ionic EAPs, the majority of D-EAPs need a rather powerful electric field in order to be activated. This is in contrast to ionic EAPs. Some of them can't be processed or shaped into functional gadgets in an effective way at all.

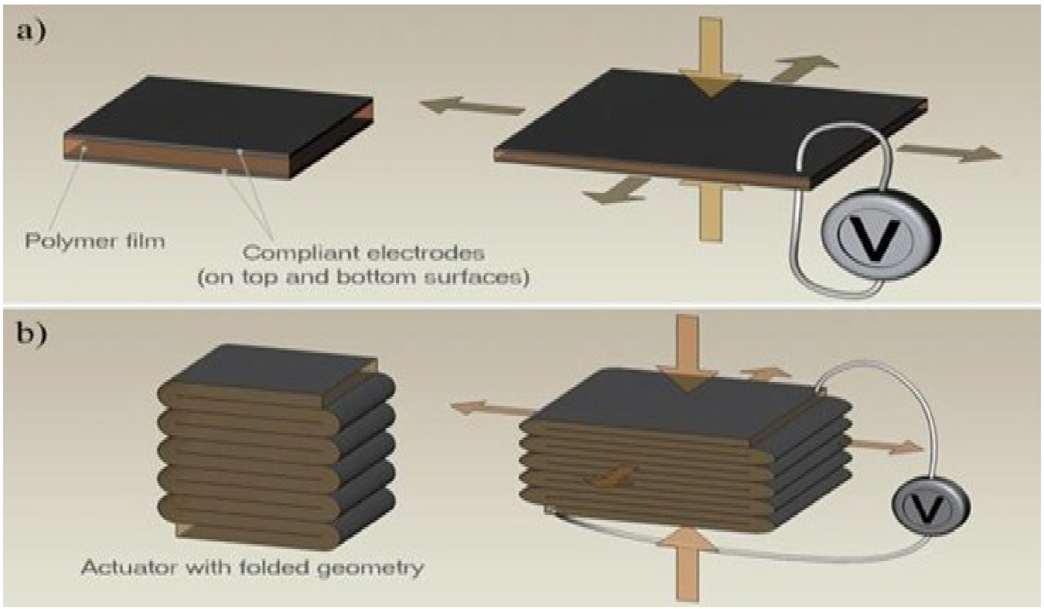
In the past, the usage of EAPs was restricted because to their extraordinarily high operating voltages, which averaged 210 volts per millimetre. The major emphasis of this effort will be on improving models that predict the overall reactivity of EAP composites as a component of their microstructure. These models will be used to analyse EAP composites. This is due to the fact that models that anticipate the overall reactivity of EAP composites as a component of their microstructure are vital to the optimum construction of EAP actuators. Specifically, this is the case because of the following: Because of this endeavour, we will have a better knowledge of EAPs, which we will utilise to form the legs (or wings) of scaled-down robots that are ideal for remote observation [12]. This will allow us to better understand how EAPs work.

[13] provided a comprehensive explanation that stated, "the High vitality electrons (1.1-2.57 MeV) illumination was used to change the stage extreme conduct of poly(vinylidene fluoride-trifluoroethylene) copolymers in an effort to significantly enhance the attributes of the copolymers." This was done in an effort to significantly improve the characteristics of the copolymers. It has come to light that when the appropriate light treatment is applied, the copolymers display almost no polarisation hysteresis at room temperature in addition to an extraordinarily enormous electrostrictive strain. This was discovered via a series of experiments, the illuminated copolymers also have a high flexible vitality thickness as well as a high mechanical load capacity. This is shown by the copolymer having a versatile modulus that is somewhat high, and also by the high strain response that occurs in

the transverse strain much when the material is under a malleable pressure of 45 MPa. [14]. "The high strain and high flexible modulus of the illuminated copolymer further bring about a better coupling factor," the authors write. "This is observed when the transverse coupling element has been found to be 0.46."

x[15, 16] [17] In this section, information on the Maxwell pressure principle is provided. When a voltage is supplied between the constant anodes, a tension is created, and the elastomer contracts while simultaneously expanding in the plane. This causes the elastomer to contract more than it grows. It was also said that the response is thought to be caused by Maxwell stress (as seen in figure no. 2), which is a dependency of the stress that is quadratic in nature upon the electric field that is being applied. Estimates of the dielectric constant of stretched polymer suggest that there is a reduction in the dielectric constant when the polymer is strained, which confirms the presence of a small electro-strictive impact. This is shown by the fact that there is a fall in the dielectric constant. After what seemed like an age, estimates of the electric breakdown field were finally obtained. A dependency on the strain is suggested by these additional signs. When the material is stretched between 400 and 400 percent, the breakdown field goes from being 22 MV/m in the unstrained express to being 220 MV/m. This occurs when the material is stretched between 500 and 500 percent. This huge increase can turn out to be important in terms of the actuator's construction in the end.

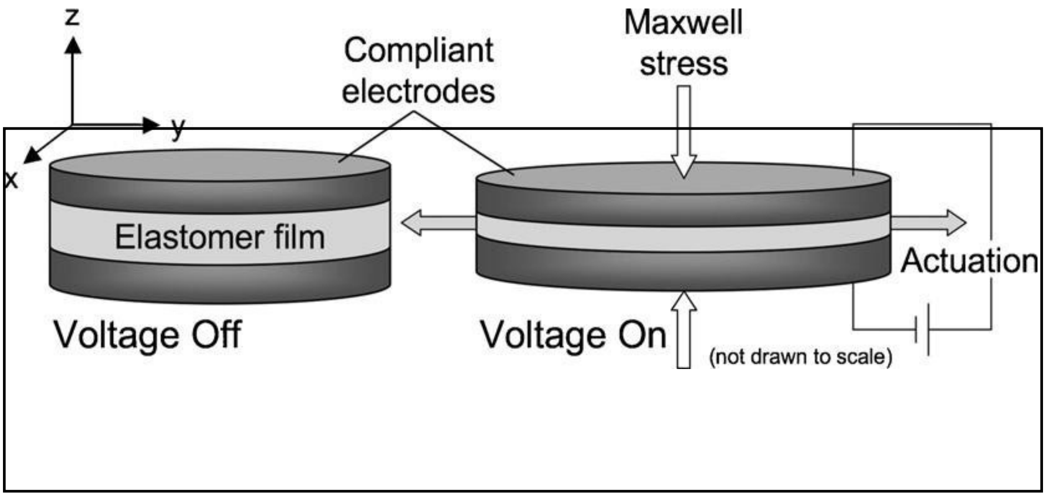
Figure 2 (i) Dielectric Elastomer (EAPs) Operating Principle. (b) The Geometry of the Proposed EAP based Actuator



[4] [18] [19] During the circular strain test, the extension of an impelled hover is measured as it is superimposed over a bigger extended film. This has been investigated at length. As a consequence of exciting a silicone film, the zone expanded by 68 percent, as seen in the accompanying image. After applying a voltage, the dynamic component of the elastomer will expand, and the strain can be readily evaluated visually as a consequence of this expansion. This expansion can be seen as a result of the following.

[20] [21] In this article, "another delicate actuators" that rely on the synthesis of electroactive polymers (EAPs) are discussed. Due to the existence of a brittle gold film on both sides of the device, which acted as cathodes, the actuators that were created out of a pre-extended silicone film were not successful in their operation. A specific collapsed shape, when carried out via an inventive manufacturing procedure, enables the abuse of the electro-strictive impact and the growth of delicate actuators that are suitable for a variety of applications in which sensitivity and adaptability are essential. This abuse of the electro-strictive impact enables the growth of delicate actuators that are suitable for applications in which sensitivity and adaptability are essential. In order to characterise these actuators, the compression in proportion to the voltage that was given was calculated, and the findings revealed that the calculation was successful. To be more exact, a withdrawal of 2% was accomplished by utilising a voltage of 2000 V as the stimulation source. This led to the desired result. In addition, by making use of the model that has been presented, it is feasible to assess the presentation of the actuators with a number of different geometrical parameters.

Figure 3: A D-EAP before and after electrical stimulation. Electrostatic attraction between oppositely charged EAP terminals generates a Maxwell worry and packs the film in the transverse (z) direction. The movie expands x and y when isochoric. Anode thickness is increased for clarity.[23] [5]



[25] [26]: Carried performed research on the reaction of the polyurethane elastomer at room temperature as well as in the temperature range that is close to the glass transition, which is the temperature at which the movements of the delicate portions become fixed. It has been shown that the Maxwell stress commitment to the strain response may have the potential to be considerable at temperatures higher than the temperature at which glass develops. [Citation needed] [Citation needed] [Further citation is required] In addition to this, the material displays a very high electro-strictive coefficient Q, which is over two orders of magnitude higher than the value indicated by PVDF. In other words, the electro-strictive coefficient Q is extremely high. In addition, it was discovered that the Q demonstrates very little change in the temperature region where the glass develops.

In [27] and [28], the authors suggest using a spring-component model, also known as an SCM, for the Monte Carlo replication of unidirectional fiber-strengthened composites. This approach tries to improve the efficiency of the computing process by changing the nonlinear balancing condition into a direct condition. This is accomplished by the use of an explicative response, which is designed to do so. This not only makes it possible for us to use the direct grid solver, but it also makes

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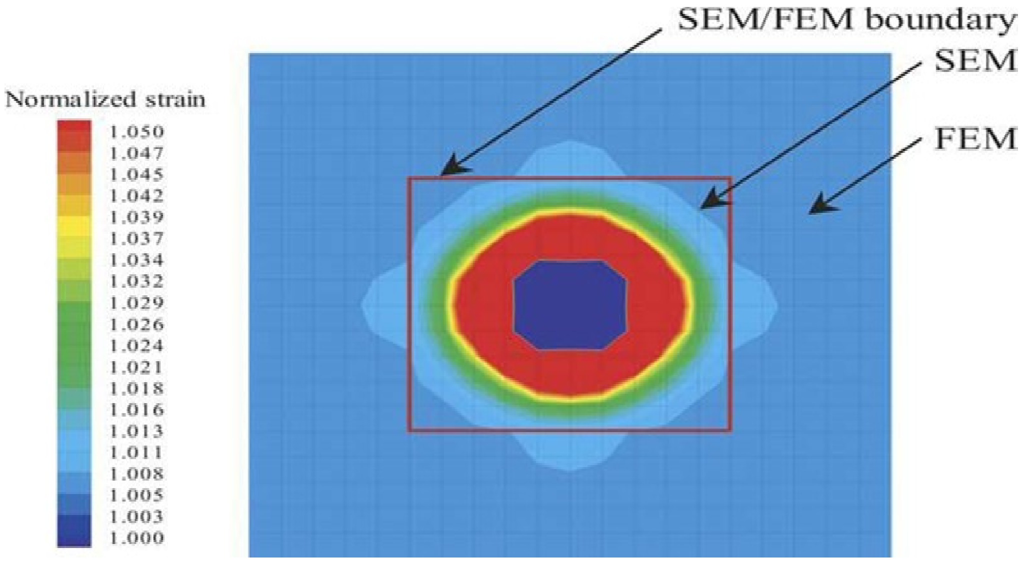
it possible for us to lower the expenses associated with computation. A SEM, in contrast to a ZC model, really integrates a three-dimensional model, which allows it to capture an accurate picture of a pressure field in all three dimensions.

Figure 4: Al2O3/Polymer-inserted Disappointing Plane Strain [33] [34].



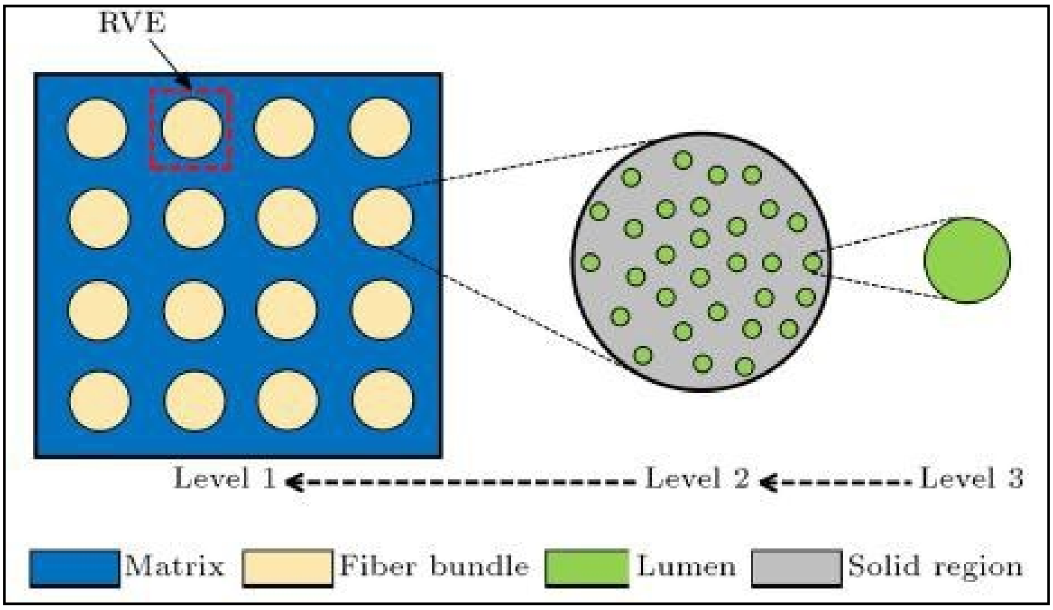
A ZC model does not incorporate a three-dimensional model. The conclusions of the three-dimensional finite element model (FEM) that are given in the literature are compatible with the pressure allocations that were computed. They got to the conclusion, as is seen in figure no. 4, that this technique produces better outcomes than the SLM strategy that we had been using before. The recommended approach makes use of a grid format in its planning, and it does well in basic design analysis (like finite element modelling, or FEM, for short) This inquiry proposes a computational technique for dissecting and duplicating the failure of unidirectional fiber-strengthened composites. The spring-component model was used in order to accomplish this task (SEM). In addition to this, they differentiate the outcomes of the recommended SEM and the outcomes of the 3D FEM. [29-32].

[35] By researching the in situ polymerization of an aniline salt inside epoxy frameworks, it was possible to successfully develop Polyaniline PANI/epoxy composites employing a number of different PANI compounds. This was accomplished. Charge carriers contained inside a PANI/epoxy composite are unable to monitor the electric field that is produced by an increasing recurrence. Because of this, the AC conductivity that is shown at higher frequencies will, as a consequence, rise with frequency, which will lead to a reduction in the capacity for charge storage. An extra impact like this one may be included into the unwinding process if desired. The composite material that shown the highest level of recurrent dependence in terms of its dielectric characteristics was the one that included the largest amount of PANI. It's possible that this is due to the fact that the composite had the maximum conductivity. In addition to this, it was found that the kind of hardener used in the PANI/epoxy composites was a critical parameter for the dielectric characteristics of the materials. When treated with the most fundamental kind of hardener (amine), the composites exhibited a low dielectric consistent. This might be because of the dedoping effect that amine has on PANI salt. This particular design demonstrated a high dielectric consistent approximately 3000, with a dielectric misfortune digression of less than 0.6 both at 10 kHz and at ambient temperature. The results of the

SEM analysis suggested that the in situ polymerization method that was used to construct the PANI/epoxy composites was successful in achieving considerable scattering and a high degree of resemblance between the PANI and the epoxy network. This was suggested by the fact that the method was used to construct the composites.

[36] investigated how the quantity of fibre present in kenaf fibre enhanced thermoplastic polyurethane composites influenced the material's mechanical and thermal properties. A two-dimensional hierarchical finite-element model of a natural fibre bundle composite has been developed as part of the scope of this research. The model's purpose is to analyse the effects that the microstructure of natural fibre bundles has on the bulk thermal property of the composite material. This research has a scope that encompasses a natural fibre bundle composite. The arrangement of the fibres in composites is shown in figure no. 5, and this particular structure is referred to as the double periodic order.

Figure 5: Each Natural Fibre Bundle in a Three-level form Contains Lumens and a Solid Area



[37] In order to examine the mechanical properties of CNT/polymer nanocomposites, a hypothetical model has been provided. A two-pronged approach was developed and implemented as part of the process of creating old-school micromechanics hypotheses in order to take into account the effect that the CNT/polymer interphase has on the mechanical characteristics of nanocomposites. This was done in order to take into account the effect that the CNT/polymer interphase has on the mechanical characteristics of nanocomposites. An examination into the effect that a number of essential small-scale parameters, including as the aggregation, cover, and peeling of CNTs, have on the mechanical properties of nanocomposites was carried out with the help of the micromechanics hypotheses that were formulated. As can be seen in figure no. 6, the research into the overall properties of the composites was carried out utilising two distinct hypothetical approaches. These approaches are compared and contrasted in the figure. The Mori-Tanaka hypothesis and the self-reliable procedure are examples of these types of techniques. Each micromechanics hypothesis was successful in resolving the various characteristics of the interphase. These characteristics were then utilised for accurate prediction of the nanocomposite as well as for assessing the influence of microstructural factors on the mechanical properties of the nanocomposite [38, 39].

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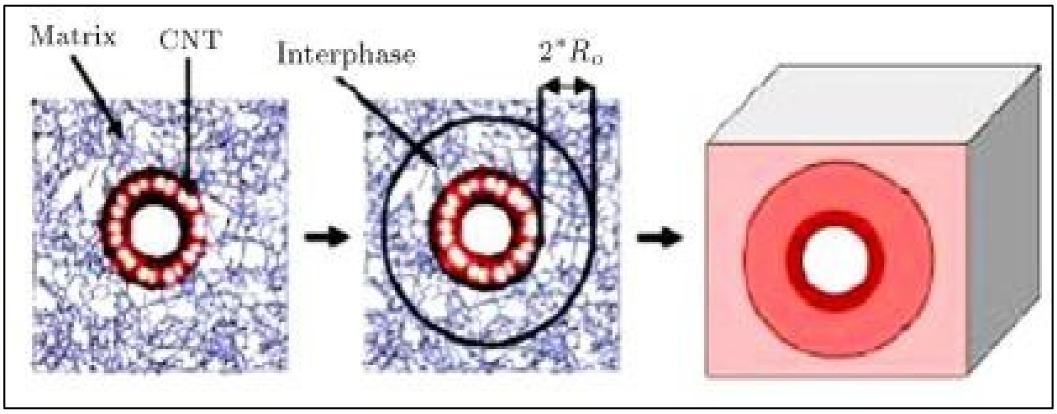
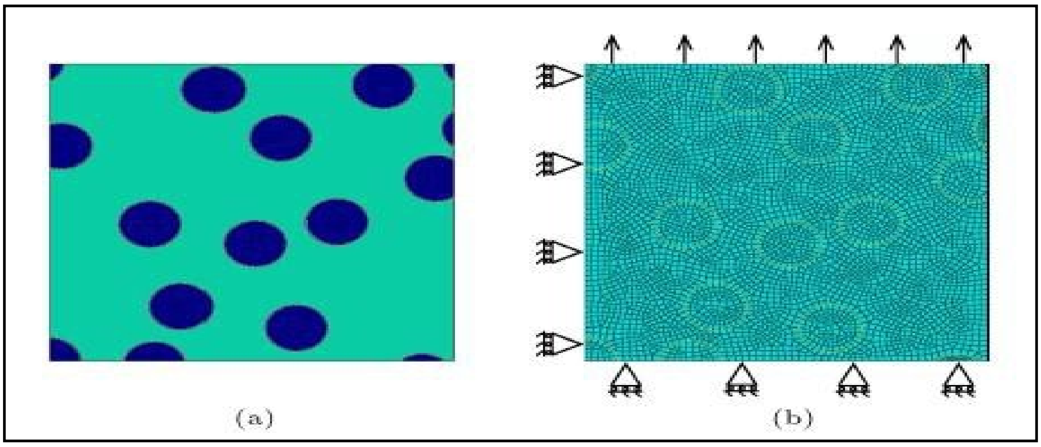
Figure 6: Schematic of the Process Used to Determine the Effective Inter Phase



[40] used the finite element approach to study the effects that particle position, shape, orientation, and size distribution have on the size-dependent flow strengthening of the SiC/Al composites (FEM). [40] Currently, research on the effect that particle size has on the behaviour of metal matrix composites is being carried out as part of this project.

Figure 7: (a) Cell with Spherical Particles (b) FEM Mesh and Boundary Conditions



Two-dimensional models were used for the purpose of conducting the inquiry and subsequent analysis. The Continuum theory of Mechanism-based Strain Gradient (CMSG) plasticity was used, as shown in figure no. 7, in order to investigate the impact that particle size has on metal matrix composites [41].

2.0 Working Principle of Electroactive Polymer

Dielectronic elastomers, also known as electro strictive polymers, are elastomers because they have low flexible moduli. Similar to biological muscles in many respects, these electro strictive polymers operate well. The abbreviation "DE" stands for "dielectric elastomers," a particular kind of chemical that falls under the umbrella term "polymers" (EAP). It's possible that the brittle and stiff nature of the pottery-making process may have something to do with the stresses that EAP-based actuators generate (EAC). Faster response times and slimmer profiles make EAPs better than shape memory amalgams (SMA). Detailed information on the most recent advancements in this field may be found here in a book written by [3]. — Most of the EAPs and dielectric elastomers may be compared to organic muscles in terms of performance and guarantee, but they are also more expensive. Dielectric elastomers and EAPs are other names for these elastomers and EAPs. Due to their inherent versatility and low weight, DE-based fibre actuators may prove to be the best solution for the construction of intelligent, multi-purpose, and responsive robots and controllers. As a result of DE's adaptability and versatility, a broad range of applications are possible. It's because DE offers several advantages over other actuator types. An equal plate capacitor may influence the activity rule of a DE actuator, and its incitation rule is based on the improvement of static weight (p) between two unending supplies of a potential contrast. An equal plate capacitor communicates with both of these criteria. An equal plate capacitor may also provide light on the DE actuator's rule of activity. The simplest form of this component is a dielectric elastomeric layer sandwiched between two sheets of a suitable termination material. After the voltage is delivered, the film is compressed and stretched by additional static powers, resulting in high pressures more than 100%.

An electromechanical incitation instrument is a real cycle that includes applying an electric field to a mechanical framework so that it may be activated. This is done so that the instrument can be used. Electrostriction and Maxwell's pressure impact are usually thought to be the key contributors to the tremendous electric-field-initiated strain that is displayed by electronic EAPs. This view is supported by a large body of scientific research. It is possible to demonstrate a relationship in the form of a quadratic between an applied electric field and the future loads and strains that are related with the two components. In the same way that dielectric elastomers or the two of them together may contribute to the strain response of an elastomer, so too can the two of them individually.

2.1 Electrostriction

In other words, there is a direct relationship between the electric polarisation and the mechanical strain response, and this link gives birth to the phenomena of electrostriction. This change in the dielectric properties of the material that happens as a consequence of strain gives rise to electrostriction. [42]

2.2 Maxwell stress effect

The Maxwell stress effect is the single factor responsible for the activation of basic shapeless polymers. It is brought on by a shift in the electric field distribution that occurs inside the dielectric as a direct result of the strain that is given to the material. On the other hand, one may interpret this as a physical representation of the Coulombic curiosity that is present between electrodes that have opposite charges.

$$S_{Maxwell}=-s\varepsilon_o\varepsilon_r E^2/2 \qquad (2)$$

$$p=\varepsilon_o\varepsilon_r E^2 = \varepsilon_o\varepsilon_r (V/t)^2$$

This paper takes into account a broad range of possible variations on the configuration of DE actuators. Actuators that have been described as having a rounded or barrel-like shape have been given in [43], [3], and [44]. These designs are quite persuasive in their appearance. In order to add two layers of electrodes to the inner and outer surfaces of the elastomeric tubes that were utilised in the construction of the tubular actuator, either a dip coating or spreading conductive particles with a polymer-based substance was employed as one of the two ways. Nevertheless, elastic tubes were used in both cases throughout the manufacturing process of the tubular actuator. — In the past ten years,

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fiber-reinforced polymeric composites have seen widespread adoption and increased use in a wide range of fundamental applications across a wide variety of business sectors due to their high quality, high ratio of solidness to weight, and low thickness. These characteristics have led to their widespread application in a variety of fundamental parts. These sectors include the automobile industry, the maritime sector, the aviation sector, and others. Isotropic conductivity is a property shared by standard auxiliary materials; this property ensures that the properties of the material are unaffected by the manner in which it is measured. Nevertheless, the direction in which the estimate is carried out has a substantial influence on the properties of fiber-reinforced composites. [Case in point:] [Case in point:] It has been shown in the past that the quality and modulus of fiber-reinforced composites reach their maximum levels when they are evaluated in a way that is longitudinal to the fibres [45]. It has been shown that this is really the case. It is expected that these attributes will be lower at some other point, with the base being seen at a ninety-degree angle to the longitudinal heading of the filaments (transverse direction).

3.0 Classification of Electroactive Polymer

3.1 Electronic EAP materials

These are, for the most part, dry substances that are driven by the electric field or the Coulomb forces. These materials are classified as I Electronic EAP Materials. Materials that are piezoelectric, electro-strictive, and ferroelectric are examples of the types of materials that are included in this category. In general, these materials have the ability to become polarised, which indicates that the strain could be coupled to the electric displacement. In electrostrictor and ferroelectric materials, the strain may be expressed as a fraction of the square of the polarisation, also known as the electric displacement. In piezoelectric materials, the amount of strain has a linear relationship to the amount of electric displacement or the external field. Despite the fact that the movement of charge in these materials is often an electronic process, when a DC field is applied, the materials behave in a manner that is analogous to that of an insulator. Research on these properties has been going on for more than three decades in the field of polymers and for more than a century in the field of single crystals. The dielectric polymers are a further category of EAP materials that are included under this category. When it comes to their mechanical properties, dielectric polymers are exceptionally malleable, and they may be easily compressed by the Coulomb forces that are connected with an electrode's electrical charge. [46] It has been shown that the amount of strain in these materials is often related to the square of the polarisation.

3.2 Materials for ionic EAP

When an external electric field is applied, the ion or molecule motion required for the proper operation of these components is triggered by an electrolyte in most cases. Ionic gels, conductive polymers, and polyaniline actuators are just a few of the many materials that fall under this broad group. [Example] The field subsequently influences the movement or diffusion of numerous ions and molecules, which finally results in an internal stress distribution.. The field controls the rate of spread. Internal stress may take several forms, including bending, volume expansion or contraction, and even twisting, depending on how it is set up. Certain types of conductive polymers may have both ionic and electronic conductivity in the same material. In compared to piezoelectric and electro-strictive materials, they are relatively new materials in the actuator sector and have gotten significantly less attention in the research literature. In contrast, a great deal of work has been done on piezoelectric and electrostrictive actuators. As a result of the large range of materials and conducting species that exist, there isn't a universally accepted phenomenological model. It's because there is currently no model for this kind of thing in existence. It's far more difficult to figure out which parts of the many different material systems are comparable to one another. In order to determine the underlying theories and scaling laws that apply to these materials, it would be very beneficial to have a better knowledge of the methodologies utilised to define the characteristics of these actuator materials. [46] More than 50% coupling efficiency is possible with the most commonly used piezoelectric ceramics, even at low electric fields, allowing for significant stresses and good coupling efficiency. By coupling at low electric fields, the piezotronic materials are able to do this (less than five volts per millimetre). It's also worth noting, though, that the deformations they may cause aren't very dangerous (the highest strain that can be achieved is less than 0.2 percent). PT single crystals, such as PZN-8 percent PT, have better characteristics in contrast to PT relaxors. Due to ferroelectricity, these crystals have a very low loss hysteresis, which considerably minimises total loss. PZN-PTs and PZN-PTs are distinct from one other in terms of the maximum strain and energy density that may be achieved, which is approximately comparable to an order of magnitude. In contrast, PZN-PT single crystals are difficult to get and expensive.

4.0 Applications

Furthermore, dielectric polymer has a high electromechanical bendability at low voltages, as well as delicate, flexible shapes. The ability to mimic the action of real muscles and to be used in wet situations is made possible by this. High dielectric steadiness and low bendable firmness, gigantic disfigurements with enormous energy efficiency and low commotion are some of the commonplace benefits that can be found in DEAPs [51]. Similarly, the seller's materials and processes might have an impact on the advantages. Consider Parker Hannifin [52], who states its EAP invention has a few distinct advantages above more traditional approaches. They claim ultra-low power consumption, 10 times longer battery life, silent operation, among other features. While this may be the case, Arkema has developed forte fluorinated EAPs (terpolymers) that can store a lot of energy as well as boast larger variations in the size and form. Different companies provide EAPs so make sure you complete your research before picking a vendor [53]. EAP actuators have a wide range of applications. benefit from their anodes' solidity (made from the noble metals Pt or Au) because of their importance in consumption resistance and rapid actuator response [51].

5.0 Conclusion

To create electroactive materials, the dielectric elastomer actuators' natural behaviour is promising. Composites have a high thermal conductivity, despite the fact that their dielectric constant is low and that their mechanical strength is low, their usage is one of the most effective methods. For usable applications, a low electric field is essential, and a high dielectric constant provides that. If charge infusion effects are nonexistent or negligible, in the composite material, the successful dielectric constant of polymer composites is higher than the dielectric constant of the lattice polymer at the permeation volume partition zone. This is the sole instance of it happening anywhere else in the composite. Epic dielectric constants may be obtained by nanocomposites if they are capable of performing a charge infusion process on a large enough scale. In order to improve the dielectric constant of an electroactive polymer, it is possible to include filler particles into the material that have a high conductivity.

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