DEVELOPMENT OF HANDY HEATING PAD FOR PAIN RELIEF

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ABSTRACT

Heat has been used as an effective way of therapy for long time. While the overall quality of warmth is related to comfort and relaxation, heat therapy provides both pain relief and healing benefits for many types of pain. Heat therapy can be provided quickly and inexpensively in the form of heating pads, which can be applied safely to the affected areas. Thermal conductivity of different fibres have been studied and properties of graphene powder also studied for improving the efficiency.

Keyword:- *Graphene Oxide, Nichrome, Thermal Conductivity.*

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1. INTRODUCTION:

Applying heat to an inflamed area will dilate the blood vessels, promote blood flow, and help sore and tightened muscles relax. Improved circulation can help eliminate the buildup of lactic acid waste occurs after some types of exercise. Heat is also psychologically reassuring, which can enhance its analgesic properties. Heat therapy is usually more effective than cold at treating chronic muscle pain or sore joints caused by arthritis. Heat therapy works by improving circulation and blood flow to a particular area due to increased temperature. Increasing the temperature of the afflicted area even slightly can soothe discomfort and increase muscle flexibility. Heat therapy can relax and soothe muscles and heal damaged tissue.

1.1 HEAT GENERATION:

The selection of electric heating materials depends on inherent resistance to the current flow to produce heat. Copper wire doesn't produce sufficiently heat when conducts electricity. Hence for an alloy as wire, rod, strip or ribbon to treat as an electric heating element it should oppose the flow of electricity.

Generally common steels and alloys like stainless steel prevent the electricity flow. This property term is known as resistivity. The technically suitable designation would be ohm. If resistivity solely was considered as the major factor for an electric heating element, the option could be from several alloy materials in a wide array of cost. By its extreme nature, an electric heating element gets hot often red hot and ordinary alloys cannot endure such extent of heat for a long period. They fail and it is called as poor life as a heating element.

The alloy families were prepared traditionally with suitable combination of two certain properties:

1.High electric resistivity
2.Prolonged service life, endurance potential as a heating material

NICKEL-CHROMIUM ALLOYS	
80 Nickel 20 Chromium	650 ohm
70 Nickel 30 Chromium	710 ohm
60 Nickel 16 Chromium Rem Iron	675 ohm
35 Nickel 20 Chromium Rem Iron	610 ohm

2. METHODOLOGY:

STEP 1 : PREPARE A FABRIC:

1. We are using a non woven fabric as a heat transfer medium and powdered Graphene for good thermal conductivity.

2. The woven or Knitted fabric is used for covering the whole setup of electric circuit and transfer medium.

STEP 2: MAKE AN ELECTRIC CIRCUIT:

1. The insulated heating wire is used for produce a heat. The type of cable is very important for differential heat produce and the length of the wire also plays a vital role.
2. An Alternate Current (AC) is converted into Direct Current (DC) using a Rectifier or AC-DC converter to provide enough heat.
3. Sew the resistance wire in a sheet as a zigzag wave like structure.

STEP 3 : END PROCESS:

1. The terminals of the wire is connected to the adapter or a battery.
2. The wire sewed sheet is placed between the Non woven.
3. Finally the whole setup is covered using the woven or knitted fabric.

3. THERMAL CONDUCTIVITY OF FIBRES:

Factors affecting thermal conductivity:

Thermal conductivity mainly depends on following matters.

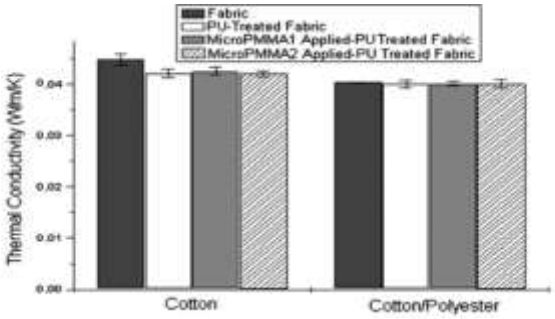
Temperature: The temperature dependence of thermal conductivity for amorphous polymers increases gradually in the glassy resign and decreases slowly or remains constant in the rubbery region. For crystalline polymers, thermal conductivity decreases steadily with the increase in temperature below . At temperature above , it behaves in a similar way as amorphous polymers.

Degree of crystallinity: Thermal conductivity depends on the degree of crystallinity; a polymer with highly crystalline and ordered structure will have higher conductivity than amorphous polymer.

Density of polymer: The thermal conductivity increases with the increasing of density of polymer.

Orientation of chain segments: Thermal conductivity of polymer is highly dependent on the polymer chain segment orientation. This is because thermal energy transports more efficient along the polymer chain. Crystalline polymers have highly oriented chain segments, and therefore have higher thermal conductivity than amorphous polymers.

Structure: The cell size of foamed polymer may also have an effect on thermal conductivity. Smaller foam cell size tend to lower thermal conductivity. Most foamed polymers have thermal conductivity values in the order of , which is about 10 times less than the same polymers.

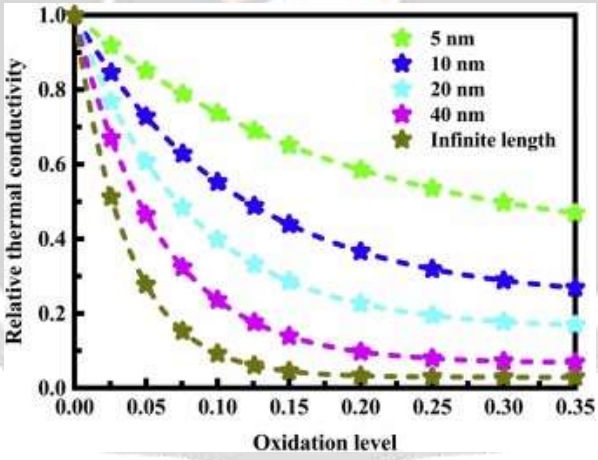


4. INCREASE THERMAL CONDUCTIVITY:

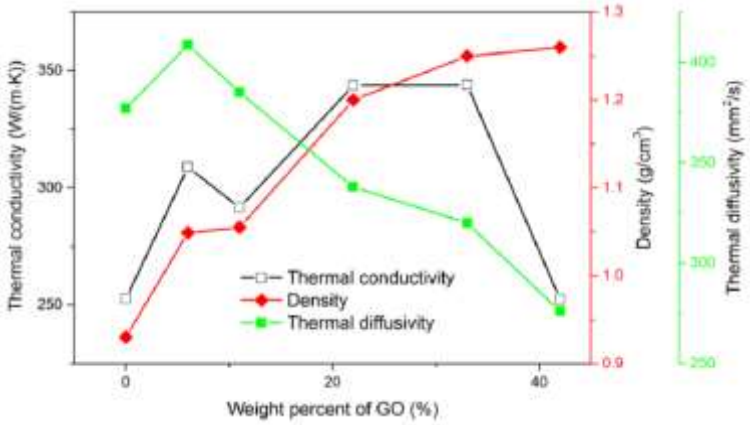
Thermal transport in graphene is a thriving area of research, thanks to graphene's extraordinary heat conductivity properties and its potential for use in thermal management applications.

The measured thermal conductivity of graphene is in the range 3000 - 5000 W/mK at room temperature, an exceptional figure compared with the thermal conductivity of pyrolytic graphite of approximately 2000 W·m−1·K−1 at room temperature. There are, however, other researches that estimate that this number is exaggerated, and that the in-plane thermal conductivity of graphene at room temperature is about 2000–4000 W·m−1·K−1 for freely suspended samples. This number is still among the highest of any known material.

The thermal properties of graphene oxide containing hydroxyl and epoxy functional groups were studied using non-equilibrium molecular dynamics to understand the thermal transport phenomena involved and the structure factors limiting heat conduction. Estimates were given in terms of phonon mean free paths for the reduction in thermal conductivity by interior defects due to scattering. The mechanism of phonon transport in the graphene oxide was discussed. The results indicated that the degree of oxidation can significantly affect the thermal performance of graphene oxide.



A low degree of oxidation is necessary to enhance the phonon transport properties of graphene oxide and reduce the probability of phonon-defect scattering. Phonon transport in graphene oxide with a high degree of oxidation is governed by the mean free path of phonons associated with scattering from interior defects. Oxygen-containing functional groups can adversely affect performance and reduce the efficiency of phonon transport in graphene oxide due to phonon mean free paths limited mainly by interior defects. The calculated intrinsic thermal conductivity of graphene oxide at room temperature is about 72 W/(m K) with an oxidation degree of 0.35 and about 670 W/(m K) with an oxidation degree of 0.05. The phonon mean free path decreases with increasing the degree of oxidation due to enhanced phonon-defect scattering, making the thermal conductivity very sensitive to the concentration of oxygen-containing functional groups.



5.CONCLUSION:

1. By providing a desirable heat produced from a pad is much enough for keep the blood flow return to normal state.
2. The heat is induced by a electrical circuit by which the temperature can be adjustable by the controller.
3. The fiber material used for the heating pad have a good thermal flow or to increase the thermal flow powdered graphene may use.
4. After various study the thermal conductivity of fiber can be increase by Graphene Oxide in a effective way.
5. However the heating pad can produce desirable heat, the efficiency should be increased by applying the powdered graphene oxide on the fibre.

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