Graphene Electric Infrared Heating Film

User Manual

Drafted by	Version	Revised on	Format
XNYX	V3.0	Oct. 01, 2021	Electronic

Contents

1. Brief Description

Bravecount Materials graphene electric heating film is composed of high grade nano graphene, inorganic polymeric particles of semi-conductive heating material and thermistor materials. The graphene electric heating sheet is one of the most advanced heating solutions, it will save more than 20% to 30% of the cost as compared with the traditional solution.

At the back side of the heating film is aluminum reflective foil, at the front side is non-woven fabric. In the middle is the heating element film. Users could cut the heating film roll to any length below 30 meters at site according to actual construction condition. However, the film width cannot be changed, which is fixed to 50cm.

2. Advantages

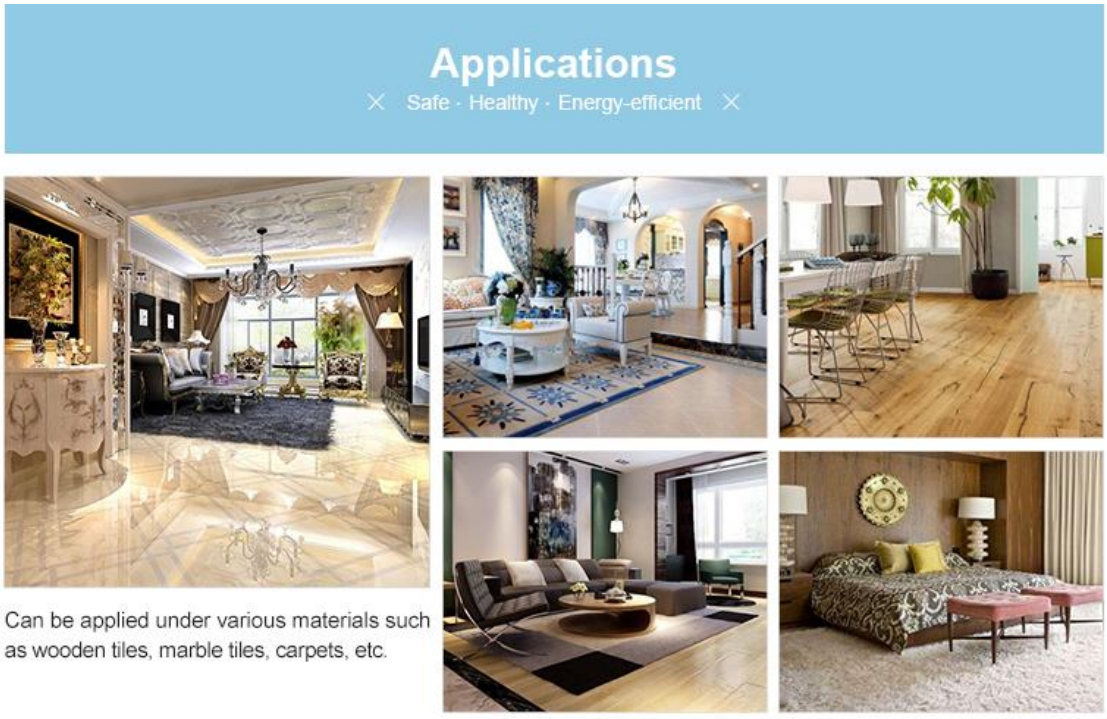
- The nanocarbon ink inside the graphene sheet features automatic temperature control ability; it is superior to the traditional solution of temperature sensor;
- The special nanocarbon ink composed of graphene and multiple microelements features quick heating and long-range radiation, the temperature can be controlled independently in each room, and the temperature is even and comfortable;
- The anion infrared ray generated when heating is benefit for human health;
- It is easy to apply without installing pipelines. It can be applied under high humidity environment and applicable for various of materials such as cement, tiles, carpets and so on.

3. Parameters

Power	Average 220W/m2, (other power versions can be customized)
Width	50cm
Length	Cut at site
Rated Voltage	AC 220V (±10%), AC 110V (±10%) can be customized
Temperature Control	Through thermostat (WiFi wireless optional), min. 16A
Safety Notes	Not recommended in bathrooms or areas with water soaking
Environmental protection	Free of CO_2, noise, methanol, benzene, radioactive materials
Energy consumption	See Appendix 1 Energy Consumption Test (tested in Ireland)
Service life	Over 50 years
Applications	House, schools, libraries, clubs, sports fields, gymnasiums, greenhouses, botanical gardens, airports, vehicles & etc.

4. Applications

Bravecount Materials graphene electric heating sheets can be applied under various materials such as wooden tiles, marble tiles, carpets, etc.



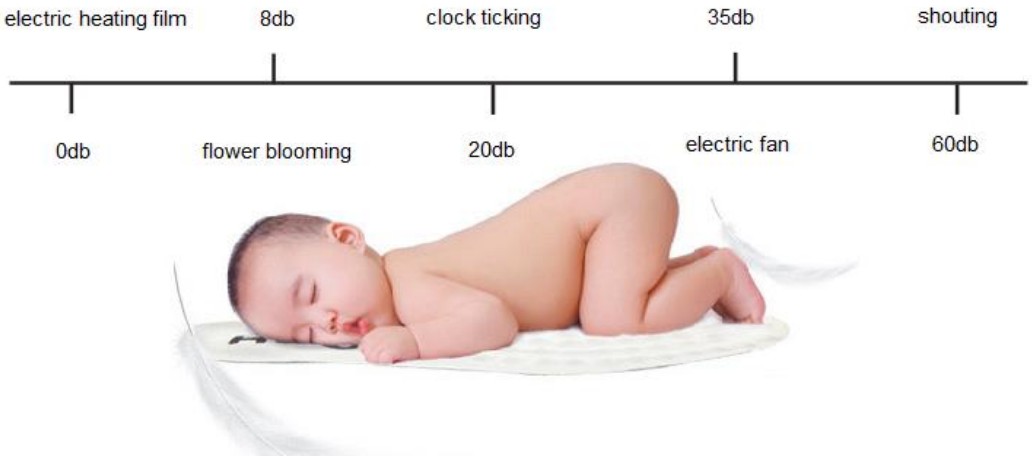
5. Advantages

- Over 50 years' service lifetime.
- IPX7 waterproof sleeved version works normally when soaked in water with power on. The current leakage is only 0.01mA, electromagnetic radiation is 0.65μT.
- Comparison among other heating solutions

	Bravecount Graphene Heating Film	**Water-Gas Heating System (boiler)**	**Heating Cable**	**Traditional Heating Film**
System Structure	Graphene heating sheet, insulation board, control panel	Gas boiler, pump, magnetic valve, insulation board, control panel, heat radiator, water pipelines	Heating cable, insulation board, control panel	Traditional heating sheet, insulation board, control panel
Installation ($100m^2$)	2 persons, 1 day	4 persons, 5 days	4 persons, 1 day	2 persons, 1 day
Maintenance Cost	No need	Replace of parts and cleaning of pipelines each year	No need	No need
Reliability Control	About 45℃ self-limited temperature rise	Risk of water leakage	External temperature sensor and controller	Low reliability, thermal decay is serious after years
Effect	Planar heating, room heated within 40 minutes, hot-cold temperature difference below 5℃	Striation heating, room heated in over 4 hours, hot-cold temperature difference above 10℃	Striation heating, room heated in about 4 hours, hot-cold temperature difference above 15℃	Planar heating, room heated within 60 minutes, hot-cold temperature difference above 10℃
Service Life	Over 50 years	Water pipelines 50 years, heat radiator 8 years, boiler fire tray 3 years	30 ~ 50 years, cable sleeve decay in 10 years, electromagnetic radiation rises seriously	3 ~ 5 years due to serious heat decay
Application Environment	No special requirement	Above $60m^2$	Mainly for small rooms like kitchen and toilet	No special requirement

5.1 No-Noise Design

The graphene electric heating sheet features no noise, which will be beneficial for your sleeping.

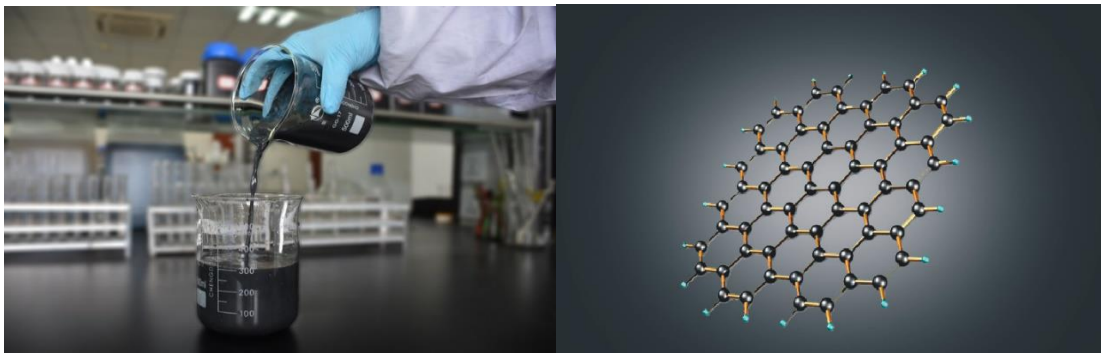


5.2 Free Temperature Control

You could enjoy heating at any time, and the temperature can be controlled independently at each room.

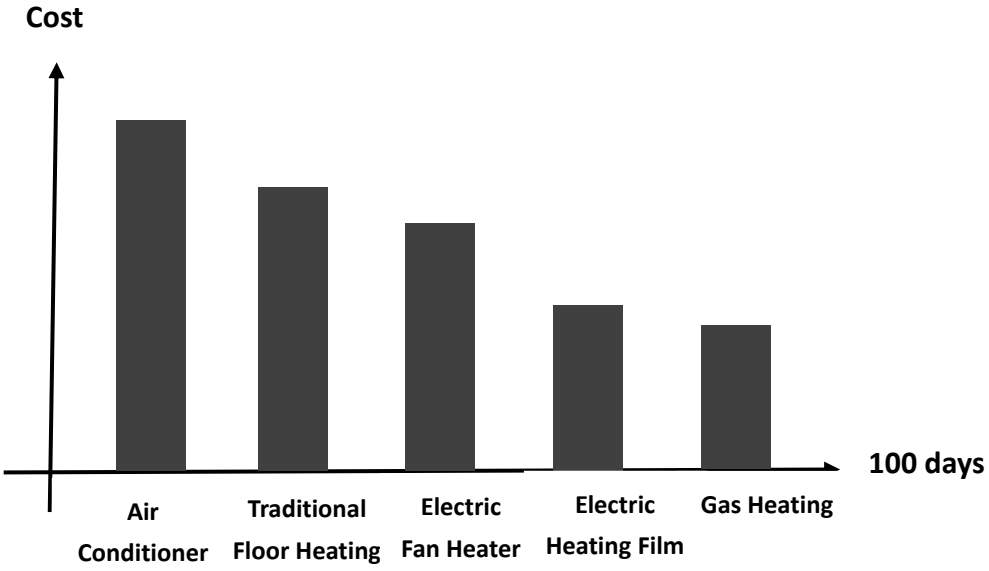
5.3 Graphene Technology

It adopts graphene in its raw materials, which absorbs and transforms 4~16um infrared ray. When the graphene absorbs 6~14um infrared ray and meets with the water molecule in human body with same vibration frequency, it will cause sympathetic vibration and then accelerates the microcirculation and improves metabolism of human body, which is beneficial for human skin.



5.4 A New Economic Heating Solution

With intelligent operation, it consumes very little electricity. It features great stability. No need to repair once damaged or scratched. It works without the traditional pipelines and boilers. And it saves cost in large degree.



6. Certifications

- CE Certification
  EN 60335-1:2012+A11:2014+A13:2017, EN 61000-3-3:2013,
  EN 61000-3-2:2014, EN 55014-2:2015, EN 55014-1:2017.
- RoHs Report

7. Installation Instruction

7.1 Tools and accessories needed:

Wire Connectors

Adhesive Tapes

Insulation Paste

Power Cables (2.5mm2)

Thermostat

Plier

7.2 Installation steps:

7.2.1 Clean the floor

Before placing insulation board or reflective films, please clear the floor. Leave no building rubbish on the ground.

7.2.2 Place insulation board (optional)

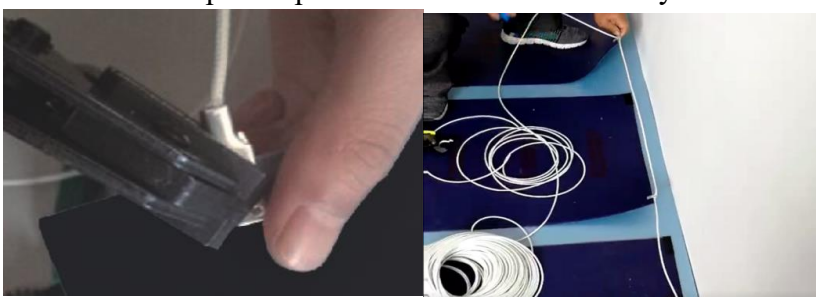
Insulation board (high quality extruded board) is only optional. It is used to save heat-up time by preventing the heat from being absorbed by the floor ground. (This material can be purchased from us or from customers' local market. Unit price is not high but shipping is not economic.)

7.2.3 Place PTC infrared heating films

Film paving: The heating films can be cut into pieces according to the room sizes. Place one layer of the heating film above the ground or insulation board directly.

Clamp installing: The wire clamps should be placed at 3cm from one edge of the film. (There is a copper strip here inside the film, it is used for introducing electricity to the film). Use plier to press the clamp tight to the film.

Cable connecting: Connect power cable to each wire clamp installed on the film. Press the clamp with plier to make the cable firmly connected.



Insulation protection: Use a small piece of insulation paste to cover at 3cm from the other edge without cable clamp on the film. (There is a copper strip here inside the film.)

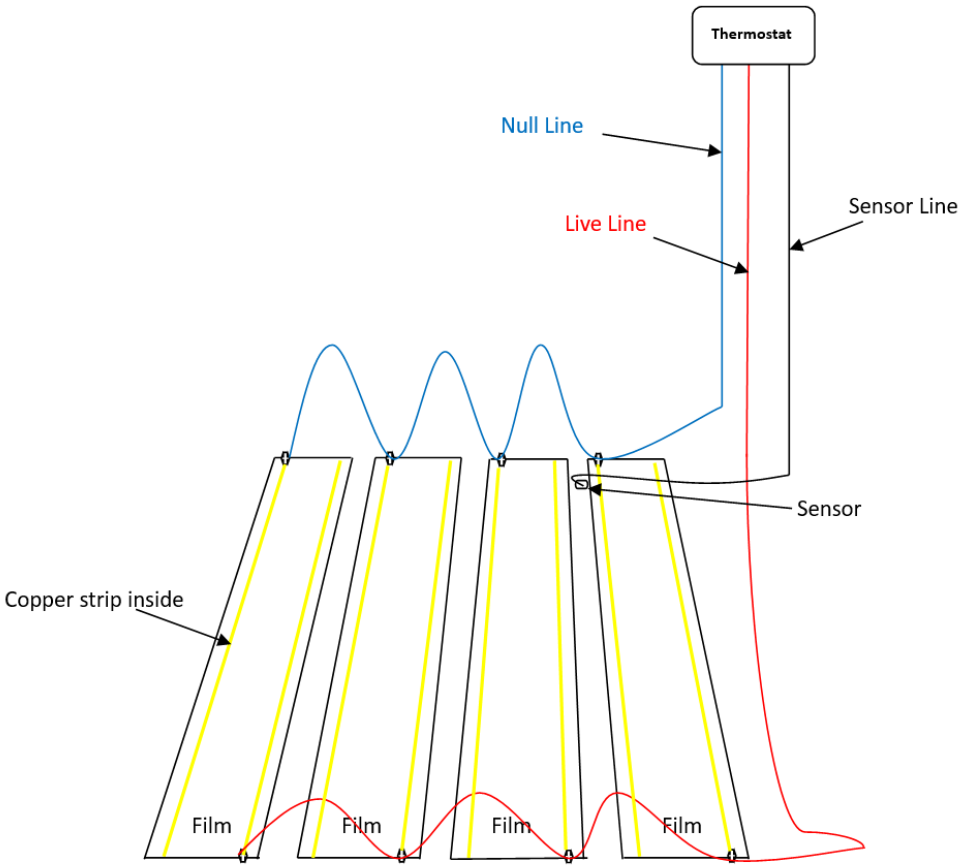
Film fixing: Use duct tapes to seal the gaps between each piece of the heating film to avoid the films from overlapping on each other.

Thermostat installing: After connecting the electric cables to each piece of heating film, the cable should be connected to the thermostat which is to be installed on the wall. The temperature sensor from the thermostat should be buried with the heating film for sensing the heating film temperature. A 16A thermostat controls about 15 square meters (30 meters).

Heating test: After heating films are completely placed, please run a heating test in each room.

Floor tile placing: After the heating is tested without failure, wood floor tiles, carpets or ceramic tiles can be placed above the heating film directly. (Room temperature heat-up time is different due to different types of floor tile.)

7.2.4 Wiring Diagram:



Appendix 1 Energy Consumption Test

Heating consumption master bedroom

Sat. 6 March 3:30am 18C 0.0kWh 1.7kW 7.8A

Sat. 6 March 9:30am 18C 3.6kWh 1.7kW 7.8A

Sat. 6 March10:00am 21C 4.2KWh 1.7kW 8A

Sat. 6 March 19:15 20C 13kWh 1.6kW 7.7A

Sat. 6 March 20:30 20.5C 16kWh 1.6kW 0.005A

Sun. 7 March 9:45 17C 20KWh 1.7KW 7.9A

Sun. 7 March 23:30 20C 30KWh 1.6KW 7.6A

Notes: Above test was conducted in Ireland. Test results may differ in other areas with different ambient temperature and thermostat set temperature.