most common approach. However, heater blankets can have problems with non-uniform heating, which can be compounded with the underlying repair site having variations of thickness and spar locations. Monitoring the temperature of the repair site and controlling the power supply to the heater in response to follow a profile or maintain relatively constant temperature to cure the resin without local hot and cold spots can be challenging. This can be especially true in cold environments where the electrical blanket controller can continually attempt to maintain temperature and drive heat into the surrounding structure, thereby unintentionally overheating and potentially thermally damaging underlying layers.

[0006] Additionally, there is sometimes a need to heat and cure resin coatings for infield repair on composite objects, such as the exterior of aircraft, without a power supply. While an open flame heater may work, open flame heaters are typically not allowed near aircraft, and/or can be dangerous, bulky and provide uneven heating.

SUMMARY

[0007] The present disclosure is directed to a method of thermally treating a material. The method comprises applying a thermal transfer blanket to a surface of the material. The thermal transfer blanket comprises a thermal energy storage media having a first temperature, the material having a second temperature that is different than the first temperature. Thermal energy is transferred between the thermal transfer blanket and the material, thereby modifying the temperature of the material. The thermal energy storage media comprises one or more layers of tiles bonded together by an elastomeric polymer.

[0008] The present disclosure is also directed to a method of making a thermal transfer blanket. The method comprises inserting a thermal energy storage media into a flexible container, the flexible container comprising a thermally insulating material. A thermocouple is attached to the thermal energy storage media so as to be in thermal communication with the thermal energy storage media. The thermal energy storage media comprises one or more layers of tiles bonded together by an elastomeric polymer.

[0009] The present disclosure is also directed to a method of repairing an object. The method comprises positioning a thermally curable patch on an exterior surface of an object, such as any of the vehicles or other objects described herein. The thermally curable patch comprises an uncured polymer having a first temperature. The method includes charging a thermal transfer blanket comprising a thermal energy storage media with thermal energy from a heat source, such as any of the heat sources described herein. The thermal transfer blanket is applied to the thermally curable patch. Thermal energy is transferred between the thermal transfer blanket and the thermally curable patch to increase the first temperature of the uncured polymer to a cure temperature for a sufficient amount of time to cure the polymer.

[0010] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the present teachings, as claimed.

CLAIMS:

1. A method of thermally treating a material, the method comprising:

applying a thermal transfer blanket to a surface of the material, the thermal transfer blanket comprising a thermal energy storage media having a first temperature, the material having a second temperature that is different than the first temperature; and

transferring thermal energy between the thermal transfer blanket and the material, thereby modifying the temperature of the material,

wherein the thermal energy storage media comprises one or more layers of tiles bonded together by an elastomeric polymer.

2. The method of claim 1, wherein thermally treating comprises heating the material.

3. The method of claim 2, wherein the material is an uncured polymer and the heating increases the temperature of the uncured polymer to a cure temperature for a sufficient amount of time to cure the polymer.

4. The method of claim 2 or 3, further comprising:

positioning the thermal energy storage media in thermal communication with a heat source; and

charging the thermal energy storage media by transferring thermal energy from the heat source to the thermal energy storage media.

5. The method of claim 4, wherein the heat source is an engine, an oven, a furnace, a radiator, a heating blanket, a chemical reaction heating pad or an open flame.

6. The method of claim 4 or 5, wherein the thermal energy storage media is heated during the charging to a temperature ranging from about 120°F (48.9°C) to about 600°F (315.6°C).

7. The method of any of claims 1-6, further comprising:

applying a thermal resistive pad to the surface of the material prior to applying the thermal transfer blanket,

wherein applying the thermal transfer blanket comprises positioning the thermal transfer blanket onto the thermal resistive pad.

8. The method of any of claims 1-7, wherein thermally treating comprises cooling the material.

9. The method of claim 8, further comprising:

positioning the thermal energy storage media in thermal communication with a cold source; and

charging the thermal energy storage media by transferring thermal energy from the thermal energy storage media to the cold source.

10. The method of claim 9, wherein the cold source is water ice, dry ice, liquid nitrogen, liquid hydrogen, a cold pack or a freezer.

11. The method of claim 9 or 10, wherein the thermal energy storage media is cooled during the charging to a temperature ranging from about -65°F (-53.9°C) to about 32°F (0°C).

12. The method of any of claims 1-11, further comprising determining the temperature at a surface of the material using a thermocouple.

13. A method of making a thermal transfer blanket, the method comprising:

inserting a thermal energy storage media into a flexible container, the flexible container comprising a thermally insulating material; and

optionally attaching a thermocouple to the thermal energy storage media so as to be in thermal communication with the thermal energy storage media,

wherein the thermal energy storage media comprises one or more layers of tiles bonded together by an elastomeric polymer.

14. The method of claim 13, further comprising applying a thermally transparent layer in direct thermal communication with the thermal energy storage media.

15. The method of claim 13 or 14, wherein the thermal energy storage media has a specific heat capacity ranging from about 120 J/KgK to about 1200 J/KgK.

16. The method of any of claims 13-15, wherein the thermal energy storage media comprises at least one material chosen from AlN, BeO, BN, diamond, Al_2O_3, and a metal.

17. The method of any of claims 13-16, wherein the thermal energy storage media comprises pellets, the pellets comprising a metal.

18. The method of claim 17, wherein at least a portion of the pellets are in a matrix material comprising an elastomeric polymer.

19. The method of claim 17 or 18, the one or more layers of tiles are disposed between the pellets and a thermally transparent layer.