CLAIMS

1. A method of removing heat energy from an object, the method comprising
   a) providing a hydrated hydrogel having a lower critical solution temperature of 70 °C or less, wherein providing the hydrated hydrogel comprises adding at least one of a biocide or an algaecide to hydrogel precursors prior to gelation of the hydrogel precursors to form the hydrated hydrogel,
   b) thermally contacting the hydrated hydrogel with an object, and
   c) allowing water to evaporate from the hydrated hydrogel, thereby removing heat energy from the object.

2. The method according to claim 1, wherein providing the hydrated hydrogel comprises exposing a non-hydrated or a partially-hydrated hydrogel having a lower critical solution temperature lower than 70 °C to ambient water vapor or rain water to hydrate the hydrogel.

3. The method according to claim 1 or 2, wherein thermally contacting the hydrated hydrogel with an object comprises arranging the hydrated hydrogel on a reflective surface of the object.

4. The method according to any one of claims 1 to 3, wherein providing the hydrated hydrogel comprises arranging the hydrated hydrogel in an enclosure, wherein at least one side of the enclosure is covered with a waterproof membrane.

5. The method according to any one of claims 1 to 4, wherein the hydrogel is selected from the group consisting of hydrogels made from a cellulose-based polymer, hydrogels made from an urethane-based polymer, hydrogels made from mixtures or copolymers of a cellulose-based polymer and an urethane-based polymer, and combinations thereof.

6. The method according to claim 5, wherein the cellulose-based polymer is selected from the group consisting of methyl cellulose, ethyl cellulose, hydroxylpropyl cellulose, N-isopropylacrylamide grafted cellulose, semi-interpenetration network of sodium carboxylmethylcellulose and N-isopropylacrylamide, mixtures thereof, and copolymers thereof.

7. The method according to claim 5 or 6, wherein the urethane-based polymer is selected from the group consisting of polyurethane multiblock copolymers of poly(propylene glycol), poly(ethylene glycol), and polycaprolactone, polyurethane multiblock copolymers of poly[(R)-3-hydroxybutyrate], poly(ethylene glycol), and poly(propylene glycol), mixtures thereof, and copolymers thereof.

8. The method according to any one of claims 1 to 7, wherein the hydrogel comprises or consists of a hydrogel made from hydroxypropyl cellulose (HPC).

9. The method according to any one of claims 1 to 8, wherein the hydrogel comprises or consists of a hydrogel made from an amphiphilic multiblock polyether/polyester urethane, wherein (i) the polyether optionally comprises or consists of polyethylene glycol and/or polypropylene glycol, and/or (ii) the polyester optionally comprises or consists of polyhydroxybutyrate.

10. The method according to any one of claims 1 to 9, wherein the hydrogel is cross-linked with a cross-linking agent selected from the group consisting of glyoxal, glutaraldehyde, polyethylene glycol diglycidyl ether, divinyl sulfone, epichlorohydrin, and combinations thereof.

11. The method according to any one of claims 1 to 10, wherein the hydrogel is cross-linked with glyoxal.

12. The method according to any one of claims 1 to 11, wherein the lower critical solution temperature of the hydrated hydrogel is 45 °C or less.

13. The method according to claim 1, wherein thermally contacting the hydrated hydrogel with the object comprises directly contacting the hydrated hydrogel with the object.

14. The method according to any one of claims 1 to 13, wherein the object is selected from the group consisting of an equipment, a display, an electronic device, a furniture, a vehicle, a structure, a fabric, an article of clothing, a building component, a building, and combinations thereof.

15. Use of a hydrated hydrogel having a lower critical solution temperature lower than 70 °C and which comprises at least one of a biocide or an algaecide entrapped within the hydrated hydrogel in removing heat energy from an object.