CLAIMS

1. A PCM comprised of:

calcium nitrate tetrahydrate; and

a nucleation agent wherein the nucleation agent is comprised of a mixture comprised of a combination of:

magnesium nitrate or any hydrate form thereof; and

strontium nitrate or any hydrate form thereof.

2. A PCM according to claim 1, wherein the PCM comprises:

between about 98% to 99.6% by weight of calcium nitrate tetrahydrate;

between about 0.2% to 1% by weight of strontium nitrate or any hydrate thereof;

between about 0.2% to 1% by weight of magnesium nitrate or any hydrate thereof.

3. A PCM according to any preceding claim, wherein the PCM has a melting temperature lower than that of each chosen component individually.

4. A PCM according to any preceding claim, wherein by altering the amounts of the chosen metal nitrates and/or hydrates thereof, the melting point of the PCM is capable of being tuned to a specific point within a range of values.

5. A PCM according to any preceding claim, wherein the PCM is a eutectic mixture of the chosen components; and optionally

wherein the PCM is a binary, ternary or quaternary eutectic mixture of the chosen components.

6. A PCM according to any preceding claim, wherein the PCM is comprised of:

about 99.2% by weight calcium nitrate tetrahydrate, about 0.4% by weight strontium nitrate tetrahydrate and about 0.4% by weight magnesium nitrate hexahydrate;

about 99.4% by weight calcium nitrate tetrahydrate, about 0.3% by weight strontium nitrate and about 0.3% by weight magnesium nitrate dihydrate;

about 57.2% by weight calcium nitrate tetrahydrate, about 42.0% by weight lithium nitrate trihydrate, about 0.4% by weight magnesium nitrate hexahydrate and about 0.4% by weight strontium nitrate tetrahydrate;

about 40.0% by weight calcium nitrate tetrahydrate, about 29.4% by weight lithium nitrate trihydrate, about 29.8% by weight copper nitrate hexahydrate, about 0.4% by weight magnesium nitrate hexahydrate and about 0.4% by weight strontium nitrate tetrahydrate;

about 32.1% by weight calcium nitrate tetrahydrate, about 23.5% by weight lithium nitrate trihydrate, about 23.8% by weight copper nitrate hexahydrate, about 19.8% by weight zinc nitrate hexahydrate, about 0.4% by weight magnesium nitrate hexahydrate and about 0.4% by weight strontium nitrate tetrahydrate;

about 24.0% by weight calcium nitrate tetrahydrate, about 17.6% by weight lithium nitrate trihydrate, about 17.9% by weight copper nitrate hexahydrate, about 39.7% by weight manganese nitrate hexahydrate, about 0.4% by weight magnesium nitrate hexahydrate and about 0.4% by weight strontium nitrate tetrahydrate;

about 39.7% by weight calcium nitrate tetrahydrate, about 59.5% by weight copper nitrate hexahydrate, about 0.4% by weight strontium nitrate tetrahydrate and about 0.4% by weight magnesium nitrate hexahydrate;

about 59.5% by weight calcium nitrate tetrahydrate, about 39.7% by weight zinc nitrate hexahydrate, about 0.4% by weight strontium nitrate tetrahydrate and about 0.4% by weight magnesium nitrate hexahydrate;

about 44.6% by weight calcium nitrate tetrahydrate, about 54.6% by weight iron nitrate nonahydrate, about 0.4% by weight strontium nitrate tetrahydrate and about 0.4% by weight magnesium nitrate hexahydrate; or

about 39.7% by weight iron nitrate nonahydrate, about 34.1% by weight calcium nitrate tetrahydrate, about 25.4% by weight lithium nitrate trihydrate, about 0.4% by weight magnesium nitrate hexahydrate and about 0.4% by weight strontium nitrate tetrahydrate.

7. A PCM according to any preceding claim, wherein the nucleation agent is present in at least about 0.1% by weight of the PCM.

8. A method of preparing a PCM according to any preceding claim comprising:

providing a mixture of calcium nitrate tetrahydrate; and

and a nucleation agent wherein the nucleation agent is a mixture comprised of a combination of:

magnesium nitrate or any hydrate form thereof; and

strontium nitrate or any hydrate form thereof;

and

heating the mixture above the melting transition temperature of one or more of the components and stirring to form a single pourable liquid.

9. A method of preparing a PCM according to claim 8, wherein an anhydrous metal nitrate and/or a metal nitrate hydrate of a lower hydration number than is desired in the final PCM composition is used in place of one or more metal nitrate hydrate(s) with the addition of an amount of water to give the final PCM composition; and optionally

wherein a metal nitrate hydrate with a higher hydration number than is desired in the PCM composition is used, and the excess water removed by or saturated with one or more anhydrous metal nitrate(s) and/or lower hydrate metal nitrate salt(s) to give the final PCM composition.

10. A method of preparing a PCM according to any of claims 8 to 9, wherein a metal nitrate solution is used, and the excess water removed or saturated with one or more anhydrous metal nitrate(s) and/or lower hydrate metal nitrate salt(s) to give the final PCM composition.

11. A method of preparing a PCM according to any of claims 8 to 10, wherein the metal nitrate and/or metal nitrate hydrate has been synthesised or produced by reaction.

12. A method of preparing a PCM according to any of claims 8 to 11, wherein the PCM is formed by neutralisation of nitric acid by the corresponding basic metal salt in the presence of the correct amount of water to achieve a specific composition.

13. A method of preparing a PCM according to any of claims 8 to 12, wherein the PCM is formed by neutralisation of nitric acid by the corresponding metal bases in the presence

of excess water which is then removed or saturated with one or more anhydrous metal nitrate(s) and/or lower hydrate metal nitrate salt(s) to give the final PCM composition.

14. A method of preparing a PCM according to any of claims 8 to 13, wherein any anion other than nitrate is removed by ion exchange, or precipitation with an appropriate metal salt followed by physical separation.

15. A method of preparing a PCM according to any of claims 8 to 14, wherein anhydrous strontium nitrate and water corresponding to about 4 equivalents with respect to the strontium nitrate are added to form the mixture.