Claims

1. A vacuum insulating panel comprising:

a porous insulating core having an upper surface and a lower surface and sides;

at least one reinforcing member arranged on the upper or lower surface of the insulating core to reinforce the core, wherein the reinforcing member is formed of a porous material, and is substantially rigid;

wherein together the at least one reinforcing member and the insulating core form a hybrid core and the reinforcing member(s) do not form a thermal bridge across the insulating core; and

an envelope, arranged to envelop the hybrid core, and to maintain an applied vacuum within the envelope;

wherein the insulating core is constructed from a microporous insulating material formed from a powder material;

wherein the density of the insulating core within the vacuum insulating panel is of from 100 kg/m^3 to 160 kg/m^3, for example from 130 kg/m^3 to 160 kg/m^3; and

wherein the thermal conductivity of the vacuum insulating panel is in the range of from 3.0 mW/m.K to 4.0 mW/m.K.

2. The vacuum insulating panel according to claim 1, having an upper reinforcing member arranged on the upper surface of the insulating core and having a lower reinforcing member arranged on the lower surface of the insulating core.

3. The vacuum insulating panel according to any preceding claim, wherein at least one of the reinforcing members has a compressive strength of between 95 kPa and 150 kPa.

4. The vacuum insulating panel according to any preceding claim, wherein the hybrid core has a compressive strength of between 95 kPa and 150 kPa.

5. The vacuum insulating panel according to any preceding claim, wherein the density of the at least one reinforcing member is lower than that of the insulating core.

6. The vacuum insulating panel according to any preceding claim, wherein at least one reinforcing member is formed of polyurethane.

7. The vacuum insulating panel according to any preceding claim wherein the insulating core is microporous and is constructed from a powder material comprising

a powder selected from the group consisting of fumed silica, precipitated silica or perlite, or combinations thereof.

8. The vacuum insulating panel according to any preceding claim wherein the insulating core is microporous and has an average pore size of from 50 nm to 350 nm.

9. The vacuum insulating panel according to any preceding claim, wherein the at least one reinforcing member comprises polyurethane and the insulating core is constructed from a material comprising fumed silica and wherein the density of the said insulating core within the vacuum insulating panel is from 100 kg/m^3 to 160 kg/m^3 for example from 100 kg/m^3 to 135 kg/m^3 or from 130 kg/m^3 to 160 kg/m^3.

10. The vacuum insulating panel according to any preceding claim, wherein the at least one reinforcing member is formed of a porous material having an average pore size of from 20 micron to 200 micron in diameter.

11. The vacuum insulating panel according to any preceding claim, with a thermal conductivity value of less than 3.5 mW/mK.

12. A method for manufacturing a vacuum insulating panel, comprising:

providing a porous insulating core having an upper surface and a lower surface and sides;

arranging at least one reinforcing member on the upper or lower surface of the insulating core to reinforce the core, wherein the reinforcing member is formed of a porous material, and is substantially rigid;

wherein together the at least one reinforcing member and the insulating core form a hybrid core and the reinforcing member(s) do not form a thermal bridge across the insulating core;

enveloping the hybrid core with a barrier envelope, optionally in the form of a barrier film; and

applying a vacuum to evacuate the barrier envelope, so that the barrier envelope closely engages the insulating core and the at least one reinforcing member(s) of the hybrid core;

wherein the insulating core is constructed from a microporous insulating material formed from a powder material;

wherein the density of the insulating core within the vacuum insulating panel is of from 100 kg/m^3 to 160 kg/m^3, for example from 130 kg/m^3 to 160 kg/m^3; and

wherein the thermal conductivity of the vacuum insulating panel is in the range of from 3.0 mW/m.K to 4.0 mW/m.K.

13. The method according to claim 12, wherein an upper reinforcing member is arranged on the upper surface of the insulating core and wherein a lower reinforcing member is arranged on the lower surface on the insulating core.

14. The method according to claim 12 or claim 13, wherein at least one reinforcing member is formed of polyurethane.

15. The method according to any one of claims 12 to 14 wherein the insulating core is constructed from a material comprising a powder material selected from the group consisting of fumed silica, precipitated silica or perlite, or combinations thereof.

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