CLAIMS

1. A passive matrix electrophoretic display material that is an electronically-addressable film comprising self-annealed microcapsules, each encapsulating an electrophoretic dispersion comprising a) electrophoretic pigment particles and b) a voltage-induced charge switching agent comprising a surfactant and a room temperature ionic liquid, dispersed in a dielectric solvent, wherein depending on magnitude, but independent of polarity, of a voltage applied to the electrophoretic dispersion, each of the electrophoretic pigment particles has a surface charge polarity which is generated and/or varied by interaction with the voltage-induced charge switching agent, and which results in movement of the electrophoretic pigment particles in a direction dictated by the surface charge polarity on the electrophoretic pigment particles upon application of the voltage.

2. The passive matrix electrophoretic display material according to claim 1, wherein the electrophoretic pigment particles comprises a white pigment and a polymer, and wherein weight ratio of the white pigment to polymer is between 50:50 and 90:10, and weight ratio of the white pigment to the dielectric solvent is between 1:100 and 1:10.

3. The passive matrix electrophoretic display material according to claim 1 or 2, wherein the surfactant is a non-ionic, oil-soluble surfactant, and wherein weight ratio of the non-ionic, oil-soluble surfactant to the room temperature ionic liquid is between 1000:1 and 10:1.

4. The passive matrix electrophoretic display material according to any one of claims 1 to 3, wherein the surfactant is polyisobutylene monosuccinimide and the room temperature ionic liquid is methyltrioctylammonium chloride or methyltrioctylammonium thiosalicylate.

5. The passive matrix electrophoretic display material according to any one of claims 1 to 4, wherein concentration of the voltage-induced charge switching agent in the electrophoretic dispersion is in the range of about 0.01 wt% to about 5 wt%.

6. The passive matrix electrophoretic display material according to any one of claims 1 to 5, wherein concentration of the voltage-induced charge switching agent in the electrophoretic dispersion is in the range of about 0.01 wt% to about 2 wt%.

7. The passive matrix electrophoretic display material according to any one of claims 1 to 6, wherein the dielectric solvent comprises more than one solvent, each of which is a non-polar or a weakly polar fluid with relative permittivity of less than 5.

8. The passive matrix electrophoretic display material according to any one of claims 1 to 7, further comprising at least one oil-soluble dye having a contrasting colour to the electrophoretic pigment particles.

9. The passive matrix electrophoretic display material according to any one of claims 1 to 8, wherein the self-annealed microcapsules are formed from one or more cross-linked copolymers.

10. The passive matrix electrophoretic display material according to any one of claims 1 to 9, wherein each of the self-annealed microcapsules has a diameter of between 10 µm to 500 µm.

11. The passive matrix electrophoretic display material according to any one of claims 1 to 10, wherein the electrophoretic pigment particles retain their position in the dispersion for an extended period of time, or indefinitely, upon application of the voltage.

12. The passive matrix electrophoretic display material according to any one of claims 1 to 11, further comprising row electrodes arranged on one face of the passive matrix electrophoretic display material and column electrodes on an opposing face of the passive matrix electrophoretic display material, wherein pixels are formed on the passive matrix electrophoretic display material that is an electronically-

addressable film comprising self-annealed microcapsules, by selectively activating a driving voltage along one or both of the row electrodes and the column electrodes.

13. A method of preparing a passive matrix electrophoretic display material according to any one of claims 1 to 12, the method comprising

a) dissolving one or more water-soluble copolymers in a water bath under stirring to form a mixture,
b) adding an electrophoretic dispersion to the mixture and emulsifying to form dispersed microcapsules, wherein each of the dispersed microcapsules encapsulates the electrophoretic dispersion,
c) adding a cross-linking agent to the resultant mixture for the dispersed microcapsules to form self-annealing microcapsules, and
d) depositing the self-annealing microcapsules onto a substrate and forming self-annealed microcapsules to obtain the passive matrix electrophoretic display material that is an electronically-addressable film comprising self-annealed microcapsules.

14. The method according to claim 13, wherein the electrophoretic dispersion is prepared by

a) physically or chemically combining pigment particles with a polymer to form modified pigment particles,
b) suspending the modified pigment particles in a dielectric solvent to form a suspension,
c) mixing and grinding the suspension to obtain a mixture comprising electrophoretic pigment particles dispersed in the dielectric solvent, and
d) adding a voltage-induced charge switching agent comprising a surfactant and a room temperature ionic liquid to the mixture to obtain the electrophoretic dispersion, wherein the voltage-induced charge switching agent interacts with the electrophoretic pigment particles to generate and/or vary a surface charge polarity on each of the electrophoretic pigment particles depending on magnitude, but independent of polarity, of a voltage applied to the electrophoretic dispersion, and which results in movement of the electrophoretic

pigment particles in a direction dictated by the surface charge polarity on the electrophoretic pigment particles upon application of the voltage.

15. The method according to claim 13 or 14, wherein depositing the self-annealing microcapsules onto a substrate and forming self-annealed microcapsules comprises applying the self-annealing microcapsules across on the substrate, and forming self-annealed microcapsules by drying the self-annealing microcapsules in air until annealing of the self-annealing microcapsules is completed.

16. The method according to any one of claims 13 to 15, further comprising arranging row electrodes on one face of the passive matrix electrophoretic display material that is an electronically-addressable film comprising self-annealed microcapsules and column electrodes on an opposing face of the passive matrix electrophoretic display material that is an electronically-addressable film comprising self-annealed microcapsules, wherein pixels are formed on the passive matrix electrophoretic display material that is an electronically-addressable film comprising self-annealed microcapsules by selectively activating a driving voltage along one or both of the row electrodes and the column electrodes.