

CLAIMS

1. A passive matrix electrophoretic display material that is an electronically-addressable film, comprising self-annealed microcapsules that contain a fluid that changes colour when an electric field is applied to the film, for which the direction of electrophoretic movement of the modified pigment particles and thus colour change is dependent on the magnitude of, and not the polarity of, the voltage of the applied electric field, by which the film can be driven using a passive matrix driving scheme.
2. The method for making the film of claim 1, where the fluid mixture contained in the film is made by mixing solvents, modified pigment particles, surfactants, and dyes, for which the modified pigment particles undergo electrophoretic movement when an electric field is applied to the fluid, and for which the direction of movement of modified pigment particles is wholly dependent on the magnitude of, and not the polarity of, the voltage of the applied electric field.
3. The method of claim 2, where the mixture of solvents is made by mixing more than one solvent, each of which is a non-polar or weakly polar fluid with low dielectric constant (relative permittivity, $\epsilon_r < 5$).
4. The method of claim 2, where modified pigment particles are made by combining a white pigment combined with a low molecular weight polymer via means of physical or chemical synthesis, in a proportion where the pigment:polymer ratio is between 50:50 and 90:10 by weight, and the pigment:solvent-mixture ratio is between 1:100 and 1:10 by weight.
5. The method of claim 2, where surfactants are added as a combination of a non-ionic oil-soluble surfactant and a room-temperature ionic liquid, added together in a proportion that facilitates voltage-induced charge switching of the pigment particles in the mixture, being that the direction of electrophoretic movement of modified pigment particles contained therein is dependent on the magnitude of, and not the polarity of, the applied electric field, and where the proportion of non-ionic oil-soluble surfactant to room-temperature ionic liquid is between 1000:1 and 10:1 by weight.
6. The method of claim 2, where an oil-soluble dye of a contrasting colour to the modified pigment particles, or a selection of oil-soluble dyes of contrasting colours to the modified pigment particles, is added to the fluid mixture and dissolved.
7. The fluid mixture of claim 2, where the modified pigment particles retain their position in the fluid for an extended period of time, or indefinitely, after any electric field has been

applied to the fluid.

8. The film of claim 1, where the film comprises a uniform layer of self-annealing microcapsules that fully encloses and encapsulates any non-aqueous liquid mixtures in discrete but co-joined capsules, each with a diameter of between 10 μm to 500 μm .
9. The method for making the film of claim 8, where the microcapsule wall material is synthesized from the combination of one or more copolymers, then cross-linked using an agent that facilitates both hardening and protection of the microcapsules and annealing of the microcapsules into a uniform film upon drying.
10. The method of claim 8, where the microcapsules can be applied as a wet slurry across a surface and be air dried, allowing the microcapsules to self-anneal and thus form a uniform film with dimensions set by the film applicator.
11. The method for making the electronically-addressable film of claim 1, where the film is placed between row electrodes on one face and column electrodes on the other, and by which pixels can be driven by voltages along select electrodes that exploit the voltage-induced charge switching properties of the fluid within the film, being that the direction of electrophoretic movement of modified pigment particles contained therein is dependent on the magnitude of, and not the polarity of, the applied electric field.
12. The method of claim 11, where the driving voltages of non-select electrodes can be 0, $\frac{1}{3}$, $\frac{1}{2}$, or $\frac{2}{3}$ of the voltages of the select electrodes, such that electrophoretic movement of particles in the film that is in contact with the non-select electrodes is either negligible or opposite to that of the electrophoretic movement of particles in the film that is in contact with the select electrodes.