[0046] Note that the content of documents referred to in this application are for information only, and are not incorporated by reference to this application.

[0047] The present invention provides an active material dispersion device including a) a top section, housing one active material dispersion engine and an active material delivery mechanism to the dispersion engine, b) a middle section, featuring a sleeve for housing one active material reservoir container and driving electronics for the active material dispersion engine, as well as active material delivery stages, upon which the top portion can be placed and interface with the middle portion, c) an active material reservoir container that contains the active material, as well as the necessary components of the active material delivery stages required for delivery of the active material to the dispersion engine, d) a bottom section that encloses the middle section and thus the device, and supports the active material reservoir containers when they are attached to the device.

[0048] Preferably, the dispersing engine is mounted between the two plates of the top section and atop the last stage of the active material delivery mechanism, for which the mounts are toric rings, or O-rings, that includes a material that has a Shore A hardness of between 45 and 55.

[0049] Preferably, the dispersion engine is a piezoelectric engine that includes of a porous metal mesh enclosed by a piezoelectric ceramic material, whereby a voltage can be applied to the piezoelectric ceramic material and cause the ceramic to vibrate at ultrasonic frequencies, and disperse any active material that is either in contact with or near contact to the porous metal mesh.

[0050] Preferably, the dispersion engine is in contact with or very near to the last stage of the active material delivery mechanism, having a rigid, porous, oleophilic, and hydrophilic wick made of polyethylene fibre.

[0051] Preferably, the bottom plate of the top section contains a ring magnet for docking with other stages of the active material delivery mechanism.

[0052] Preferably, the middle section of the housing contains a printed circuit board, or PCB,

that features circuitry, including microprocessor, and a rechargeable lithium polymer battery to supply power to the circuitry and to the piezoelectric engine for the driving of the piezoelectric engine housed in the top section of the device as described above.

[0053] Preferably, the middle section of the housing further features a direct mechanism for user interface with the device, including a seven-segment display and two buttons, whereby the user can programme the dispersion device following the settings provided by the microprocessor on the PCB, as well as a USB interface for programming of the device and charging of the rechargeable lithium polymer battery detailed above.

[0054] Preferably, the PCB and circuitry, including microprocessor, feature components that enable the user to interface with the device via an indirect mechanism such as Bluetooth and Wi-Fi.

[0055] Preferably, an active material reservoir container is a container of a certain volume made of glass, plastic, or metal, and can be fit into the housing via a sleeve as described above.

[0056] Preferably, the active material reservoir container also features components of the active material delivery mechanism, including a soft, hydrophilic, and oleophilic wick made of polyethylene, that fits into the bottle and delivers active material to the last stage of the active material delivery mechanism described above.

[0057] Preferably, the active material reservoir container features a cap through which the soft, hydrophobic, and oleophilic wick can fit through and thus interface directly through contact with the last stage of the active material delivery mechanism described above.

[0058] Preferably, the cap component of the active material reservoir container further features a rubber- or polymer-coated washer that interfaces with and magnetically docks to the top section of the dispersion device as described above, providing good contact with the last stage of the delivery mechanism and sealing the interface between the active material reservoir container and the docking portion of the device.

[0059] Preferably, the bottom section of the device features two magnets mounted on posts that dock with two magnets attached to the bottom of the middle section of the device, thus

supporting the active material reservoir container and fully enclosing the device.

[0060] The present invention further provides an active material dispersion device including a) a top section housing three active material dispersion engines, each with their own components for their respective active material delivery mechanisms, b) a middle section featuring three sleeves for housing active material reservoir containers, allowing for up to three active material reservoir containers to be placed within and be used by the device, as well as driving electronics for the active material dispersion engines and active material delivery stages, upon which the top portion can be placed and interfaced with, c) a bottom section that encloses the middle portion and thus the device, along with any active material reservoir containers when they are attached to the device.

[0061] Preferably, the top section includes two plates that are connected by posts fitted through ports in the bottom plate, as well as clips that extend from the side of the top plate, and attached to the middle section via screws that are fitted through posts in the middle section, and slots for the clips.

[0062] Preferably, the three dispersing engines are mounted between the two plates of the top section and atop the last stage of the active material delivery mechanism, whereby the mounts for each of the dispersing engines are toric rings, or O-rings, that includes a material that has a Shore A hardness of between 45 and 55.

[0063] Preferably, the dispersion engines are identical to the dispersion engines described above.

[0064] Preferably, the dispersion engines are in contact with or very near to the last stage of the active material delivery mechanism for each dispersion engine, comprising rigid, porous, oleophilic, and hydrophilic wicks made of polyethylene fibre.

[0065] Preferably, the bottom plate of the top section contains a ring magnet at each of the three last stage delivery mechanisms, for docking with other stages of the active material delivery mechanism.

[0066] Preferably, the middle section of the housing contains a printed circuit board, or PCB, that features circuitry, including microprocessor, and a rechargeable lithium polymer battery

to supply power to the circuitry and to the piezoelectric engines for the driving of the piezoelectric engines housed in the top section of the device as described above**.**

[0067] Preferably, the middle section of the housing features a direct mechanism for user interface with the device, that includes a seven-segment display and four buttons, whereby the user can programme each dispersion engine of the device following the settings provided on the microprocessor on the PCB, as well as a USB interface for programming of the device and charging of the rechargeable lithium polymer battery detailed above.

[0068] Preferably, the PCB and circuitry, including microprocessor, feature components that enable the user to interface with the device via an indirect mechanism such as Bluetooth and Wi-Fi.

[0069] Preferably, the bottom section of the device features one magnet mounted on a post that docks with a magnet attached to the bottom of the middle section of the device, thus supporting the active material reservoir containers placed within the device and fully enclosing the device.

CLAIMS

1. An active material dispersion device for dispensing an active material comprising:

a housing comprising a top section and a middle section;

an active dispersion engine adapted to disperse the active material, the active dispersion engine being housed by the top section; and

an active material delivery mechanism adapted to deliver the active material to the active dispersion engine, the active material delivery mechanism comprising a last stage of the active material delivery mechanism, the last stage being housed by the top section of the housing, wherein the active dispersion engine is mounted atop the last stage of the active material delivery mechanism;

wherein the middle section of the housing is adapted to house an active material reservoir container for containing the active material, wherein the active material reservoir container is adapted to contain the active material delivery mechanism adapted to deliver the active material within the active material reservoir container to the last stage of the active material delivery mechanism in the top section, wherein the active material reservoir container is adapted to be connectable to the top section.

2. The dispersion device of claim 1, wherein the active material reservoir container is attachable to the housing via at least one of magnets, screws, clips, glue and necked seal.

3. The dispersion device of claims 1 or 2, wherein the top section comprises a top plate and a bottom plate below the top plate, wherein the active dispersion engine is being mounted between the top plate and the bottom plate.

4. The dispersion device of claim 3, wherein the active dispersion engine is mounted to the top plate and the bottom plate via a top toric ring and a bottom toric ring respectively.

5. The dispersion device of claim 4, wherein the top toric ring and the bottom toric ring include O-rings made from a material that has a Shore A hardness of between 10 and 90.

6. The dispersion device of any one of claims 3 to 5, wherein the active material reservoir container comprises a cap adapted to be screwed onto the active material reservoir container, wherein the cap is adapted to allow the active material delivery mechanism to fit therethrough, and wherein the cap is adapted to be attachable to the bottom plate of the top section.

7. The dispersion device of claim 6, wherein the cap comprises a washer encased thereon, wherein the washer is adapted to be magnetically dockable to the ring-shaped magnet.

8. The dispersion device of claim 7, wherein the washer comprises a rubber or polymer-coated washer.

9. The dispersion device of any one of claims 3 to 8, wherein the bottom plate of the top section comprises a ring-shaped magnet that is housed in a cavity in the bottom plate.

10. The dispersion device of any one of claims 1 to 9, wherein the active dispersion engine is in contact with or very near to the last stage of the active material delivery mechanism.

11. The dispersion device of any one of claims 1 to 10, wherein the last stage of the active material delivery mechanism comprises a porous, oleophilic and/or hydrophilic wick made of synthetic fibres.

12. The dispersion device of any one of claims 1 to 11, wherein the active material reservoir container is made of glass, plastic, or metal.

13. The dispersion device of any one of claims 1 to 12, wherein the dispersion engine comprises a piezoelectric engine comprising a porous metal mesh enclosed by a piezoelectric ceramic material, wherein a voltage is applicable to the piezoelectric ceramic material to cause it to vibrate at ultrasonic frequencies so as to disperse any active material that is in contact with or near contact to the porous metal mesh.

14. The dispersion device of any one of claims 1 to 13, wherein the active material delivery mechanism in the active material reservoir container comprises a hydrophilic, and/or oleophilic wick made of synthetic fibres.

15. A multi-system material dispersion device for dispensing at least one active material, the multi-system material comprising:

a housing comprising a top section and a middle section;

at least one active dispersion engine adapted to disperse the at least one active material, the at least one active dispersion engine being housed by the top section; and

at least one active material delivery mechanism adapted to deliver the at least one active material to the at least one active dispersion engine respectively, each of the at least one active material delivery mechanism comprising a last stage of the active material delivery mechanism, the last stage being housed by the top section of the housing, wherein each of the at least one active dispersion engine is mounted atop the last stage of the at least one active material delivery mechanism;

wherein the middle section of the housing is adapted to house at least one active material reservoir container for containing the at least one active material respectively, wherein each of the at least one active material reservoir container comprises the at least one active material delivery mechanism adapted to deliver the at least one active material within the at least one active material reservoir container to the respective last stage of the at least one active material delivery mechanism in the top section, wherein each of the at least one active material reservoir container is adapted to be connectable to the top section.

16. The dispersion device of claim 15, wherein each of the at least one active material reservoir container is attachable to the top section via at least one of magnets, screws, clips, glue and necked seal.

17. The dispersion device of claims 15 or 16, wherein the top section comprises a top plate and a bottom plate below the top plate, wherein the at least one active dispersion engine is being mounted between the top plate and the bottom plate.

18. The dispersion device of claim 17, wherein each of the at least one active dispersion engine is mounted to the top plate and the bottom plate via a top toric ring and a bottom toric ring respectively.

19. The dispersion device of claim 18, wherein each of the top toric ring and the bottom toric ring includes an O-ring made from a material that has a Shore A hardness of between 10 and 90.

20. The dispersion device of any one of claims 17 to 19, wherein each of the at least one active material reservoir container comprises a cap adapted to be screwed onto each of the at least one active material reservoir container, wherein the cap is adapted to allow the active material delivery mechanism to fit therethrough, and wherein the cap is adapted to be attachable to the bottom plate of the top section.

21. The dispersion device of claim 20, wherein each of the cap comprises a washer encased thereon, wherein the washer is adapted to be magnetically dockable to the at least one ring-shaped magnet.

22. The dispersion device of claim 21, wherein the washer comprises a rubber or polymer-coated washer.

23. The dispersion device of any one of claims 17 to 22, wherein the bottom plate of the top section comprises at least one ring-shaped magnet that is housed in a cavity respectively in the bottom plate.

24. The dispersion device of any one of claims 15 to 23, wherein the at least one active dispersion engine is in contact with or very near to the respective last stage of the at least one active material delivery mechanism.

25. The dispersion device of any one of claims 15 to 24, wherein the last stage of each of the at least one active material delivery mechanism comprises a porous, oleophilic and/or hydrophilic wick made of synthetic fibres.

26. The dispersion device of any one of claims 15 to 25, wherein the at least one active material reservoir container is made of glass, plastic, or metal.

27. The dispersion device of any one of claims 15 to 26, wherein the at least one active material delivery mechanism in the respective at least one active material reservoir container comprises a hydrophilic and/or oleophilic wick made of synthetic fibres.

28. The dispersion device of any one of claims 15 to 27, wherein the dispersion engine comprises a piezoelectric engine comprising a porous metal mesh enclosed by a piezoelectric ceramic material, wherein a voltage is applicable to the piezoelectric ceramic material to cause it to vibrate at ultrasonic frequencies so as to disperse any active material that is in contact with or near contact to the porous metal mesh.

29. The dispersion device of any one of claims 15 to 28, wherein the dispersion device comprises three active material dispersion engines, three active material delivery mechanism, and three active material reservoir containers.