CLAIMS

1. An integrated multi-color micro-LED display chip, comprising:

a substrate;

an array of pixel drivers supported by the substrate;

a plurality of arrays of different color micro LEDs supported by the substrate and electrically connected to the array of pixel drivers, wherein at least one of the arrays comprises organic micro LEDs of a first color and another one of the arrays comprises inorganic micro LEDs of a different color, the different color micro LEDs are arranged into two or more strata stacked on top of the substrate and pixel drivers with a planar interface between adjacent strata, all micro LEDs of a same color are contained in one of the strata, and the micro LEDs of different strata are grouped into multi-color pixels; and

a structure in the strata that optically separates adjacent multi-color pixels.

2. The integrated multi-color micro-LED display chip of claim 1, wherein the plurality of arrays comprise an array of red micro LEDs, an array of green micro LEDs, and an array of blue micro LEDs.

3. The integrated multi-color micro-LED display chip of claim 2, wherein the blue micro LEDs are inorganic micro LEDs, and the red and green micro LEDs are organic micro LEDs.

4. The integrated multi-color micro-LED display chip of claim 3, wherein the blue micro LEDs are GaN based inorganic micro LEDs.

5. The integrated multi-color micro-LED display chip of claim 2, wherein the blue and red micro LEDs are inorganic micro LEDs and the green micro LEDs are organic micro LEDs.

6. The integrated multi-color micro-LED display chip of claim 1, wherein the different color micro LEDs are ultraviolet, blue, green, orange, red, or infrared micro LEDs.

7. The integrated multi-color micro-LED display chip of claim 1, wherein each stratum contains only inorganic micro LEDs or only organic micro LEDs but not both.

8. The integrated multi-color micro-LED display chip of claim 7, wherein the strata(um) containing inorganic micro LEDs are at a bottom of the stack, and the strata(um) containing organic micro LEDs are at a top of the stack.

9. The integrated multi-color micro-LED display chip of claim 1, wherein each strata(um) containing inorganic micro LEDs contains inorganic micro LEDs of only a single color.

10. The integrated multi-color micro-LED display chip of claim 1, wherein all organic micro LEDs are contained in a single stratum.

11. The integrated multi-color micro-LED display chip of claim 1, wherein each stratum containing inorganic micro LEDs comprises:

lower contact metal pads electrically connected to a bottom of the micro LEDs; and

upper contact metal pads electrically connected to a top of the micro LEDs;

wherein the lower contact metal pads are also electrically connected to the array of pixel drivers and the upper contact metal pads are also electrically connected to a common electrode.

12. The integrated multi-color micro-LED display chip of claim 11, wherein the common electrode includes a top electrode on top of all the strata, each upper contact metal pad electrically connected to the top electrode by vias through any intervening strata.

13. The integrated multi-color micro-LED display chip of claim 11, wherein the common electrode comprises a separate common electrode structure for each stratum located on top of that stratum, each upper contact metal pad for each stratum electrically connected to the common electrode structure for that stratum.

14. The integrated multi-color micro-LED display chip of claim 1, wherein the micro LEDs are not larger than 50 microns in any lateral dimension.

15. The integrated multi-color micro-LED display chip of claim 1, wherein the array of micro LEDs for each color has an external quantum efficiency of at least 15%.

16. The integrated multi-color micro-LED display chip of claim 1, wherein the pixel drivers comprise thin-film transistor pixel drivers or silicon CMOS pixel drivers.

17. An integrated multi-color micro-LED display chip, comprising:

a substrate;

an array of pixel drivers supported by the substrate; and

an array of red micro LEDs, an array of green organic micro LEDs and an array of blue inorganic micro LEDs, all of the arrays of micro LEDs supported

by the substrate and electrically connected to the array of pixel drivers; wherein the different color arrays of micro LEDs are arranged into two or more strata stacked on top of the substrate and pixel drivers, with a planar interface between adjacent strata, and the blue inorganic micro LEDs are contained in a bottom one of the strata and the green organic micro LEDs are contained in a top one of the strata, and the micro LEDs of different strata are grouped into multi-color pixels; and

a structure in the strata that optically separates adjacent multi-color pixels.