CLAIMS

1. A light-emitting device comprising:

an array comprising a plurality of microLEDs and non-light-emitting areas separating adjacent microLEDs; and

a solid wavelength-converting layer disposed on the array and comprising:

a plurality of first regions aligned with the plurality of microLEDs and comprising phosphor particles of a first characteristic size dispersed in a first transparent binder material; and

a second region aligned with the non-light-emitting areas and comprising phosphor particles of a second characteristic size dispersed in a second transparent binder material, the second region exhibiting optical scattering greater than optical scattering exhibited by the first regions.

2. The light-emitting device of claim 1, the first characteristic size differing from the characteristic second size.

3. The light-emitting device of claim 1, the second characteristic size being less than 50% of the first characteristic size.

4. The light-emitting device of claim 1, the first characteristic size being less than 10. μm, or the second characteristic size being less than 5. μm.

5. The light-emitting device of claim 1, spacing of the microLEDs of the array being less than 0.10 mm, or width of the non-light-emitting areas separating adjacent microLEDs of the array being less than 0.010 mm.

6. The light-emitting device of claim 1, (i) the first regions comprising the phosphor particles of the first characteristic size embedded in a first solid medium that is transparent, and (ii) the second region comprising the phosphor particles of the second characteristic size embedded in a second solid medium that is transparent.

7. The light-emitting device of claim 6, the first regions differing from the second region with respect to differing compositions or refractive indices characterizing the solid first medium and the solid second medium.

8. The light-emitting device of claim 6 further comprising scattering particles embedded in the second solid medium.

9. The light-emitting device of claim 6, the first solid medium including one or more polymers, or the second solid medium including one or more polymers.

10. The light-emitting device of claim 6, the first solid medium including one or more silicones, and the second solid medium including one or more silicones.

11. The light-emitting device of claim 6, the first and second solid media having the same material composition.

12. The light-emitting device of claim 1, (i) the first regions comprising the phosphor particles of the first characteristic size and a transparent first coating on the phosphor particles of the first regions that binds together the phosphor particles of the first regions, and (ii) the second region comprising the phosphor particles of the second characteristic size and a transparent second coating on the phosphor particles of the second region that binds together the phosphor particles of the second region.

13. The light-emitting device of claim 12, the first regions differing from the second region with respect to differing size, number density, or volume fraction characterizing voids among the phosphor particles of the first regions and voids among the phosphor particles of the second region.

14. The light-emitting device of claim 12, the first regions differing from the second region with respect to differing thicknesses, compositions, or refractive indices characterizing the first coating and the second coating.

15. The light-emitting device of claim 12, the first coating having a thickness greater than 0.20 μm, or the second coating having a non-zero thickness less than 0.10 μm.

16. The light-emitting device of claim 12, the first coating including one or more metal or semiconductor oxides, and the second coating including one or more metal or semiconductor oxides.

17. The light-emitting device of claim 12, the first and second coatings having the same material composition.

18. The light-emitting device of claim 12, the first coating or the second coating including one or more materials compatible with formation using an atomic layer deposition (ALD) process or using a conformal chemical vapor deposition (CVD) process.

19. The light-emitting device of claim 12, (i) the second coating having a characteristic thickness that is less than 50% of a characteristic thickness of the first coating, or (ii) number density or volume fraction of voids among the phosphor particles of the first regions being less than 50% of number density or volume fraction of voids among the phosphor particles of the second region.

20. The light-emitting device of claim 1, the first regions exhibiting a contrast ratio for down-converted light exiting the wavelength-converting layer from adjacent first regions thereof that is greater than 5:1, the down-converted light resulting from absorption of light emitted by the microLEDs and subsequent emission of the down-converted light at a wavelength longer than a wavelength of the light emitted by the microLEDs.