WHAT IS CLAIMED IS:

1. A method for fabricating one or more metasurface elements or systems comprising:

depositing a hard mask material layer on at least one surface of a substrate, wherein the substrate is transparent to light over a specified operational bandwidth;

depositing a pattern material layer on the hard mask material layer;

patterning the pattern material to form an array pattern atop the hard mask layer, the array pattern comprising one of either a positive or negative reproduction of a metasurface feature array, the metasurface feature array comprising a plurality of metasurface features having feature sizes smaller than the wavelength of light within the specified operational bandwidth and configured to impose a phase shift on impinging light within the plane of plurality of metasurface features;

etching the hard mask layer using an anisotropic etch process to form a plurality of voids and raised features corresponding to the array pattern in the hard mask; and

removing any residual pattern material from atop the hard mask layer.

2. The method of claim 1, wherein:

the substrate is formed of a material selected from the group consisting of: fused silica, sapphire, borosilicate glass and rare-earth oxide glasses;

the hard mask material layer is formed of a material selected from the group consisting of: silicon, silicon nitride of various stoichiometries, silicon dioxide, titanium dioxide, alumina, and is disposed using a deposition process selected from the group consisting of: sputtering, chemical vapor deposition, and atomic layer deposition;

the pattern material layer is formed from one of either a photoresist patterned using a lithographic process, or a polymer patterned using a nanoimprint process;

the array pattern is etched using a reactive ion etching process selected from the group consisting of: SF_6, Cl_2, BCl_3, C_4F_8 or any static or multiplexed mixture thereof; and

the residual pattern material is removes using a process selected form the group consisting of: chemical solvent, chemical etchant, and plasma etchant.

3. The method of claim 1, wherein the patterned hard mask material is a dielectric and forms the metasurface features of the metasurface element.

4. The method of claim 1, further comprising:

depositing a dielectric metasurface material layer on the patterned hard mask material layer such that the metasurface material layer fills the voids in the hard mask material layer and extends above the raised features of the hard mask material layer forming an over-layer of metasurface material atop the hard mask layer; and

planarizing the over-layer such that the metasurface material layer and the hard mask layer terminate at a uniform height above the substrate.

5. The method of claim 4, wherein:

the metasurface material layer is formed from a material selected from silicon, silicon nitride of various stoichiometries, silicon dioxide, titanium dioxide, alumina, and is deposited using a conformal process selected from the group of: chemical vapor deposition, and atomic layer deposition; and

the planarization uses a process selected from an etch process selected from the group consisting of wet etch and a plasma etch, or a chemical-mechanical planarization technique.

6. The method of claim 4, wherein the metasurface material disposed in the voids forms the metasurface features of the metasurface element, and wherein the hard mask material is configured as an embedding material having a lower index of refraction at the specified operational bandwidth than the metasurface material.

7. The method of claim 6, wherein the hard mask material has negligible absorption over the specified operational bandwidth and has an index of refraction at the specified operational bandwidth between about 1 and about 2.4

8. The method of claim 4, further comprising:

removing the hard mask material layer using a selective etch such that the metasurface material layer disposed in the voids of the patterned hard mask remains on the surface of the substrate after removal of the hard mask material layer to form a plurality of isolated metasurface features separated by a plurality of air gaps.

9. The method of claim 8, further comprising depositing an embedding material layer on the isolated metasurface features such that the air gaps between the features are filled and such that the embedding material layer extends above the surface of the metasurface material layer, wherein the embedding material layer has a lower index of refraction at the specified operational bandwidth than the metasurface material.

10. The method of claim 9, wherein the embedding material is a polymer selected form the group consisting of poly(methyl methacrylate), SU8, and benzocyclobutene.

11. The method of claim 9, wherein the embedding material is a solid film selected from the group consisting of silicon dioxide, aluminum oxide, titanium dioxide, silicon nitride, hafnium oxide, zinc oxide, and spin-on-glass.

12. The method of claim 9, further comprising planarizing the embedding material layer such that the metasurface material layer and the embedding material layer terminate at a uniform height above the substrate.

13. The method of claim 12, further comprising depositing an anti-reflective coating atop one or both the embedding material layer and the side of the substrate disposed opposite the metasurface element.

14. The method of claim 13, wherein the antireflective coating is composed of alternating layers of any combination of materials selected from the group consisting of silicon dioxide, titanium dioxide, aluminum oxide, silicon nitride, aluminum nitride, and amorphous silicon, wherein each of the alternating layers has a thickness less than the wavelength of light within the operational bandwidth.

15. The method of claim 1, wherein the substrate is one of either disposed atop an illuminator or sensor, or is itself an illuminator or sensor.

16. The method of claim 1, wherein the substrate has a substrate thickness unsuitable for use with a target optical system and further comprising at least one of the following:

removing at least a portion of the backside of the substrate through one or both grinding or chemical etching; and

aligning and fusing an additional substrate to the substrate of the metasurface element.

17. The method of claim 16, wherein the additional substrate itself has a metasurface element disposed on one surface thereof, and wherein the substrate and additional substrate are fused along surface opposite the surfaces on which the relative metasurface elements are disposed.

18. The method of claim 16, wherein the method of fusing uses a bonding process having a thermal budget below 600 °C.

19. The method of claim 18, wherein the bonding process is a wafer bonding process using an adhesive selected from the group of an optical epoxy, benzocyclobutene, a UV cured polymer, SU8, and a plasma activate silicon dioxide film.

20. The method of claim 18, further comprising removing at least a portion of the backside of one or both of the substrates prior to fusing.

21. The method of claim 1, further comprising forming at least a first metasurface element on a first side of a first substrate, and forming at least a second metasurface element on a first side of a second substrate, and fusing the first and second substrates together along sides opposite the first sides of said substrates using a bonding process having a thermal budget below 600 °C.

22. The method of claim 1, wherein the plurality of metasurface features are inhomogeneous.

23. The method of claim 1, wherein the plurality of metasurface features diverge from an ideal shape by a pre-determinable amount based on the dimensions of the metasurface features.

24. The method of claim 1, wherein the metasurface element is embedded and planarized and comprises two layers of metasurface features offset from each other by a distance smaller than or on the same order as the wavelength of light within the specified operational bandwidth such that the two layers of metasurface features operate in conjunction to impose a phase shift on impinging light.

25. The method of claim 1, wherein the plurality of metasurface features are inhomogeneous and diverge from an ideal shape by a pre-determinable amount based on the dimensions of the metasurface features, and wherein the ideal shape is a square, and where the ideal square has a side dimension of less than 200 nm the metasurface features are formed as circles, and where the ideal square has a side dimension of less than 300 nm the metasurface features are formed as squares having rounded edges.

26. The method of claim 1, further comprising:

forming a plurality of identical or unique first metasurface elements;

providing a plurality of identical or unique illumination sources disposed in a planar array and integrating at least one of the plurality of first metasurface elements with each of the plurality of illumination sources in the array such that light from each of said plurality of illumination sources passes through

at least one of the first metasurface elements and an angular deflection is imposed thereby;

disposing a first spacer layer between the planar array of illumination sources and the first metasurface elements, the first spacer layer being configured to create divergence in light emitted from each of the illumination sources of the planar array prior to impinging on the respective first metasurface element;

disposing a second metasurface element at a distance from the plurality of first metasurface elements, the second metasurface element configured to imprint a far-field illumination pattern onto a light field formed by the emission of all of the plurality illumination sources; and

disposing a second spacer layer between the first and second metasurface elements such that an offset distance is formed therebetween.

27. The method of claim 1, further comprising:

forming a plurality of identical or unique first metasurface elements;

providing a plurality of identical or unique sensor elements disposed in a planar array and integrating at least one of the plurality of first metasurface elements with each of the plurality of sensor elements in the array such that light impinging on each of said plurality of sensor elements passes through at least one of the first metasurface elements and an angular deflection is imposed thereby;

disposing a first spacer layer between the planar array of sensor elements and the first metasurface elements, the first spacer layer being configured to create convergence in light impinging on each of the first metasurface elements of prior to impinging on the respective sensor elements of the planar array;

disposing a second metasurface element at a distance from the plurality of first metasurface elements, the second metasurface element configured to

imprint a far-field illumination pattern onto a light field impinging thereon; and

disposing a second spacer layer between the first and second metasurface elements such that an offset distance is formed therebetween.