[0024] The module 20 also includes an interior wall 30 that separates the emission and detection channels 21A, 21B from one another. The interior wall 30 can be composed, for example, of the same non-transparent material as the spacer 28. These features can help reduce optical cross-talk between the channels 21A, 21B and can help reduce the amount of stray light entering the module. In some implementations, a baffle 40 is provided over the covers 26A, 26B to reduce stray light and/or optical cross-talk even further. The baffle 40 also form the upper part of the module's outer walls. The interior wall 30 can extend upwardly such that it reaches the same height above the substrate support 24 as does the top of the baffle 40. Like the spacer 28, different regions of the baffle 40 have different lengths. Thus, in the illustrated example, the length of the baffle 40 in the region encircling the upper portion of the detection channel is less than the length of the baffle in the region encircling the upper portion of the emission channel.

[0025] The optoelectronic devices 22A, 22B can be mounted to the substrate 24, for example, using flip chip technology or wire bonding technology. In some implementations, the underside of the devices 22A, 22B can include conductive contacts that electrically couple the optoelectronic devices 22A, 22B to conductive pads on the surface of the support substrate 24. The support substrate 24, in turn, can include plated conductive vias that extend from the conductive pads vertically through the substrate 24 and that are coupled to one or more solder balls or other conductive contacts on the exterior side of the substrate 24. The conductive contacts on the exterior of the support substrate 24 allow the module 20 to be mounted, for example, on a printed circuit board in a handheld device such as a mobile phone, tablet or other consumer electronic device.

[0026] Modules such as the one illustrated in FIG. 1 and described above can be fabricated, for example, in a wafer-level process. Wafer-level processes allow multiple modules 20 can be fabricated at the same time. Generally, a wafer refers to a substantially disk- or plate-like shaped item, its extension in one direction (yz-direction or vertical direction) is small with respect to its extension in the other two directions (x- and zy- or lateral directions). In some implementations, the diameter of the wafer is between 5 cm and 40 cm, and can be, for example, between 10 cm and 31 cm. The wafer may be

What is claimed is:

1. An optoelectronic module comprising:

a support substrate on which are mounted first and second optoelectronic devices;

a first transmissive cover over the first optoelectronic device at a first height above the support substrate;

a second transmissive cover over the second optoelectronic device at a second height above the support substrate, the second height being different from the first height;

exterior walls laterally encircling the first and second optoelectronic devices, the exterior walls composed of a material that is non-transparent to one or more wavelengths of light emitted by or detectable by the first and second optoelectronic devices; and

an interior wall separating the first and second optoelectronic devices from one another, the interior wall being composed of ~~the same material as the exterior walls~~ a material that is nontransparent to one or more wavelengths of light emitted by or detectable by the first and second optoelectronic devices.

2. The optoelectronic module of claim 1 further including at least one respective passive optical element on ~~each~~ at least one of the transmissive covers.

3. The optoelectronic module of any one of the previous claims wherein at least one of the first or second transmissive covers is tilted at an angle with respect to the support substrate.

~~4. The optoelectronic module of any one of the previous claims wherein the first and second transmissive covers are composed of different materials from one another.~~

~~5~~4. The optoelectronic module of any one of the previous claims wherein the first transmissive cover has a different thickness from a thickness of the second transmissive cover.

65. The optoelectronic module of any one of the previous claims wherein an optical channel for the first optoelectronic device defines a first focal length, and wherein an optical channel for the second optoelectronic device defines a second focal length different from the first focal length.

76. The optoelectronic module of any one of the previous claims wherein the first optoelectronic device includes a light emitting element arranged to emit light through the first transmissive cover, and wherein the second optoelectronic device includes a light detecting element arranged to detect light received through the second transmissive cover.

87. The optoelectronic module of any one of the previous claims wherein the exterior walls separate the support substrate and the transmissive covers from one another.

98. The optoelectronic module of any one of the previous claims wherein a respective side edge of each of the transmissive covers is in contact with the interior wall.

109. The optoelectronic module of any one of the previous claims wherein an outer side edge of each of the transmissive covers is substantially flush with a respective outer side of the exterior walls.

101. The optoelectronic module of any one of ~~the previous~~ claims 1 – 9 wherein an outwardly facing side edge of each of the transmissive covers is covered by an exterior wall portion that is non-transparent to one or more wavelengths of light emitted by or detectable by the first and second optoelectronic devices.

112. The optoelectronic module of claim ~~11~~10 wherein the exterior wall portions covering the outwardly facing side edges of the transmissive covers are composed of ~~the same material as the exterior walls~~ a material that is nontransparent to one or more wavelengths of light emitted by or detectable by the first and second optoelectronic devices.

123. The optoelectronic module of any one of the previous claims further including a baffle over the transmissive covers, wherein the baffle is composed of ~~the same material as the exterior walls~~ a material that is nontransparent to one or more wavelengths of light emitted by or detectable by the first and second optoelectronic devices.

134. A method of fabricating optoelectronic modules, the method comprising:

supporting a plurality of singulated transmissive substrates in a combined replication and vacuum injection tool, wherein various ones of the singulated transmissive substrates are supported at a first height and other ones of the singulated transmissive substrates are supported at a second different height;

replicating passive optical elements onto at least one side of ~~each~~ at least one of the singulated transmissive substrates while the singulated transmissive substrates are supported in the combined replication and vacuum injection tool;

using a vacuum injection technique to form a respective spacer feature on a first side of each singulated transmissive substrate and a respective baffle feature on a second side of each singulated transmissive substrate, and to form interior wall features separating adjacent ones of the singulated transmissive substrates from one another, while the singulated transmissive substrates are supported in the combined replication and vacuum injection tool; and

removing from the combined replication and vacuum injection tool a structure comprising the transmissive substrates, the passive optical elements, the spacer features and the interior wall features.

145. The method of claim ~~14~~13 further including:

attaching the structure to a support substrate on which are mounted a plurality of optoelectronic devices to obtain a stack in which each optoelectronic device is disposed below a portion of a respective one of the transmissive substrates; and

separating the stack into multiple optoelectronic modules each of which includes a first transmissive cover over a first one of the optoelectronic devices at a first distance

and a second transmissive cover over a second one of the optoelectronic devices at a second distance.

15~~6~~. The method of claim ~~14~~13 further including:

separating the structure into a plurality of sections; and

attaching optoelectronic devices to one or more sections of the structure to form one or more optoelectronic modules.

16~~7~~. The method of any one of claims ~~14~~13 - ~~16~~15 including replicating passive optical elements onto both sides of ~~each~~ at least one of the singulated transmissive substrates while the singulated transmissive substrates are supported in the combined replication and vacuum injection tool.

~~18. The method of any one of claims 15 – 17 wherein, when the structure is attached to the support substrate, each transmissive substrate has a width such that it is disposed directly over a plurality of the optoelectronic devices separated from one another by one of the spacer features.~~

~~19. The method of any one of claims 14 – 19 wherein the combined replication and vacuum injection tool includes:~~

~~first platforms having an upper surface to support some of the singulated transmissive substrates at the first height; and~~

~~second platforms to support the other ones of the singulated transmissive substrates at the second height.~~

~~20~~17. A method of fabricating optoelectronic modules, the method comprising:

supporting a plurality of singulated transmissive substrates on a sacrificial substrate in a first combined replication and vacuum injection tool, wherein various ones of the singulated transmissive substrates are supported at a first height and other ones of the singulated transmissive substrates are supported at a second different height;

replicating first passive optical elements onto a first side of ~~each~~ at least one of the singulated transmissive substrates while the singulated transmissive substrates are supported in the first combined replication and vacuum injection tool;

using a vacuum injection technique to form a respective spacer feature on the first side of each singulated transmissive substrate and to form interior wall features separating adjacent ones of the singulated transmissive substrates from one another while the singulated transmissive substrates are supported in the first combined replication and vacuum injection tool;

removing a first structure from the first combined replication and vacuum injection tool and separating the first structure from the sacrificial substrate, wherein the first structure comprises the transmissive substrates, the first passive optical elements, the spacer features and the interior wall features;

using a second combined replication and vacuum injection tool to replicate second passive optical elements onto a second side of ~~each~~ at least one of the singulated transmissive substrates;

using the second combined replication and vacuum injection tool to form a respective baffle feature on the second side of ~~each~~ at least one of the transmissive substrates; and

removing from the second combined replication and vacuum injection tool a second structure comprising the transmissive substrates, the first and second passive optical elements, the spacer features, the interior wall features and the baffle features.

~~21~~18. The method of claim ~~20~~17 further including:

attaching the second structure to a support substrate on which are mounted a plurality of optoelectronic devices to obtain a stack in which each optoelectronic device is disposed below a portion of a respective one of the transmissive substrates; and

separating the stack into multiple optoelectronic modules each of which includes a first transmissive cover over a first one of the optoelectronic devices at a first distance and a second transmissive cover over a second one of the optoelectronic devices at a second distance.

~~22. The method of claim 21 wherein, when the second structure is attached to the support substrate, each transmissive substrate has a width such that it is disposed directly over a plurality of the optoelectronic devices separated from one another by one of the spacer features.~~

~~23. The method of any one of claims 20 – 22 wherein some of the sacrificial substrate includes raised platforms on which the other ones of the singulated transmissive substrates are supported at the second different height.~~