CLAIMS

1. A pattern structure of a photomask for a patterned sapphire substrate (PPS), wherein the pattern structure is formed by stitching a plurality of identical polygons each comprising at least two sector-shaped opaque areas and one transparent area, wherein the plurality of polygons are joined together by stitching the sector-shaped opaque areas into round opaque areas, wherein each of the plurality of polygons is axisymmetric, wherein the sector-shaped opaque areas in each of the plurality of polygons are defined by arcs having a same radius, wherein in each of the plurality of polygons, a sum of central angles of the arcs that define the sector-shaped opaque areas is equal to 180°, and wherein boundary areas of the photomask that are unable to accommodate a complete one of the polygons are configured as opaque areas.

2. The pattern structure of a photomask for a PPS of claim 1, wherein the plurality of polygons are pentagons each comprising two adjacent interior angles that are right angles, wherein sides of the right angles serve as sides of the sector-shaped opaque areas and the right angles constitute the central angles of the arcs that define the sector-shaped opaque areas, wherein the two right angles have two sides opposing each other and having a same length that is equal to the radius of the sector-shaped opaque areas.

3. The pattern structure of a photomask for a PPS of claim 1, wherein the plurality of polygons are equilateral triangles each having three sector-shaped opaque areas with central angles of 60° formed at three corners of the equilateral triangle.

4. The pattern structure of a photomask for a PPS of claim 1, wherein the round opaque areas have a diameter of from 2 μm to 2.3 μm.

5. The pattern structure of a photomask for a PPS of claim 1, wherein each of

the round opaque areas has a perimeter that is stitched by the arcs of the corresponding sector-shaped opaque areas of the corresponding polygons, and wherein each arc on one side of the photomask is able to form a complete circle with a complementary arc on an opposing side of the photomask.

6. The pattern structure of a photomask for a PPS of claim 5, wherein upon superimposing of the boundary areas of two identical photomasks, and on adjacent sides of the two photomasks, the arcs on one of the photomasks are stitched to and form complete circles with complementary arcs on the other one of the photomasks.

7. An exposure method using a photomask having the pattern structure of a photomask for a patterned sapphire substrate as defined in claim 1, wherein after a patterned region is formed by exposing the photomask, the photomask is caused to have boundary areas thereof superimposed with boundary areas of the patterned region such that arcs on one side of the photomask are stitched to and form complete circles with complementary arcs on an opposing side of the patterned region, and then the photomask is exposed again.