

Claims:

1. A diamond comprising of:
at least one surface; and
a plurality of nanostructures formed on the at least one surface of the diamond,
wherein the plurality of nanostructures generates one or more structural colours
on the surface of the diamond.
2. The diamond according to claim 1, further generate a visual perception selected from a group of perceptions consisting of: perception of image, perception of depth and perception of size.
3. The diamond according to any one of the preceding claims, wherein nanostructures within the plurality of nanostructures are identical in shapes.
4. The diamond according to any one of the preceding claims, wherein nanostructures within the plurality of nanostructures are categorized to at least two different shapes.
5. The diamond according to any one of the preceding claims, wherein the shape of nanostructures is defined by a cross-sectional area as viewed from a direction normal to the surface and can be selected from a group consisting of: triangular, rectangular, hexagonal, octagonal, polygonal, circular, and elliptical shapes.
6. The diamond according to any one of the preceding claims, wherein nanostructures within the plurality of nanostructures are categorized according to at least two different heights.
7. The diamond according to any one of the preceding claims, wherein the nanostructures within the plurality of nanostructures are arranged in a periodic formation.
8. The diamond according to any one of the preceding claims, wherein at least two adjacent nanostructures are separated by a distance that ranges between 40 nanometers (nm) and 200 nm.

9. The diamond according to any one of the preceding claims, wherein the periodic formation is large enough to generate the structural colours that is visually discernable by human eyes.
10. The diamond according to any one of the preceding claims, wherein each nanostructure is having a cross-sectional length that ranges between 100 nm and 500 nm, and is extended from the at least one surface of the diamond by a distance that is less than 500 nm.
11. The diamond according to any one of the preceding claims, wherein each nanostructure comprises a top surface, a bottom surface and a side surface, wherein the top surface is having a surface smoothness of less than 10 nm, the side surface is having a surface smoothness of less than 20 nm and the bottom surface is having smoothness of less than 10 nm.
12. The diamond according to any one of the preceding claims, wherein a group of nanostructures within the plurality of nanostructures is having one or more properties which are different than another group of nanostructures within the plurality of nanostructures.
13. The diamond according to any one of the preceding claims, further comprising: another plurality of nanostructures formed on the surface of the diamond, wherein another plurality of nanostructures generates other structural colours on the surface of the diamond, wherein the structural colours is different than the other structural colours.
14. The diamond according to any one of the preceding claims, further comprising another surface on the diamond that is on a different plane than the surface of the diamond, wherein the another surface comprises a plurality of nanostructures.
15. The diamond according to any one of the preceding claims, wherein the diamond is either mined, CVD or HPHT diamond.

16. The diamond according to any one of the preceding claims, wherein the diamond is intrinsically a coloured diamond.
17. The diamond according to any one of the preceding claims, wherein at least one surface is functionalized by a gaseous termination that is selected from group of gaseous terminations consisting of: hydrogen termination and oxygen termination.
18. A diamond comprising:
 - at least one surface; and
 - a plurality of nanostructures formed on the at least one surface of the diamond, wherein the plurality of nanostructures generates a visual perception on the at least one surface of the diamond.
19. The diamond according to claim 18, wherein the visual perception is selected from a group of perceptions consisting of: perception of colour, perception of depth and perception of size.
20. A method of forming a diamond that displays a structural colours, comprising:
 - providing a surface of the diamond; and
 - forming a plurality of nanostructures on the surface of the diamond, wherein the plurality of nanostructures generate a structural colours when shined with a visible light.
21. The method according to claim 20, wherein forming the plurality of nanostructure further comprises: etching the surface of the diamond to form the nanostructures.
22. The method according to claim 20 or 21, wherein the etching is using an inductive coupling plasma reactive ion etching (ICP/RIE).
23. The method according to any one of claims 20 to 22, wherein gas composition when performing the ICP/RIE consists of gases selected from a group of: inert gas and chlorine, and wherein the inert gas is argon, helium, neon, krypton, xenon, or a mixture of more than one of these.

24. The method according to any one of claims 20 to 23, wherein forming the plurality of nanostructure further comprises: coating a layer of resist onto the surface of the diamond; using a lithography technique, exposing selected area on the surface of the diamond; and developing nano-pattern on the surface of the diamond.
25. The method according to any one of claims 20 to 24, wherein the lithography technique is selected from group consisting of: electron beam writing, proton beam writing, focused ion beam, laser interference lithography, self-assemble lithography, block copolymer lithography (BCP), and Anodic Aluminium Oxide (AAO) lithography.
26. The method according to any one of claims 20 to 25, further comprising: functionalizing the surface with a gaseous termination that is selected from group of gaseous terminations consisting of: hydrogen termination and oxygen termination.
27. The method according to any one of claims 20 to 26, further comprising: forming another plurality of nanostructures on the surface of the diamond, wherein the plurality of nanostructures generate another structural colours when shined with the visible light.