

What is claimed is:

1. A structured illumination microscopy (SIM) system comprising:
a light source;
a light-structuring component to provide light from the light source with a SIM pattern for performing illuminations of a sample at a substrate having a substrate pattern, wherein a pitch of the SIM pattern is based on a characteristic of the substrate pattern; and
an image sensor to detect emissions that the sample generates in response to the illuminations.
2. The SIM system of claim 1, wherein the substrate pattern includes a periodic pattern, and wherein the pitch of the SIM pattern is based on a pitch of the periodic pattern.
3. The SIM system of claim 2, wherein the pitch of the SIM pattern is greater than the pitch of the periodic pattern.
4. The SIM system of claim 3, wherein the pitch of the SIM pattern is between about 1.5 and about 2 times the pitch of the periodic pattern.
5. The SIM system of any of claims 2-4, wherein the light-structuring component includes a grating for generating the SIM pattern, the grating corresponding to the pitch of the periodic pattern.
6. The SIM system of any preceding claim, wherein the substrate pattern comprises nanowells formed at the substrate.
7. The SIM system of claim 6, wherein the substrate pattern comprises that the nanowells are arranged in a square array.
8. The SIM system of claim 7, wherein the square array has the nanowells arranged in linear rows and linear columns, wherein the linear rows are substantially perpendicular to the linear columns.
9. The SIM system of claim 8, wherein a first linear row or linear column is illuminated by the SIM pattern, wherein a second linear row or linear column is parallel to and adjacent the first linear row or linear column, and wherein the second linear row or linear column is not illuminated by the SIM pattern when the first linear row or linear column is illuminated by the SIM pattern.
10. The SIM system of any preceding claim, wherein the light source includes at least one of a laser or a light-emitting diode.
11. The SIM system of any preceding claim, wherein the sample comprises a biological material, and wherein the image sensor is to sense fluorescence emitted by the sample in response to the illuminations.

12. The SIM system of any preceding claim, wherein the SIM system is configured to rotate the SIM pattern about an optical axis into modulation angles, wherein at least one of the illuminations is performed at each of the modulation angles of the SIM pattern.

13. The SIM system of claim 12, wherein the substrate pattern is a periodic pattern, and wherein the SIM system is configured to provide an offset to each of the modulation angles of the SIM pattern to form offset modulation angles, none of the offset modulation angles corresponding to an angle of a symmetry axis of the periodic pattern, wherein at least one of the illuminations is performed at each of the offset modulation angles of the SIM pattern.

14. The SIM system of any of claims 1, 6, or 10-12, wherein the substrate pattern includes a random pattern, and wherein the pitch of the SIM pattern is based on a resolution relating to the random pattern.

15. The SIM system of claim 14, wherein the pitch of the SIM pattern is about a same order of magnitude as the resolution relating to the random pattern.

16. A method comprising:
configuring a structured illumination microscopy (SIM) system for performing illuminations of a sample at a substrate having a substrate pattern;
selecting a pitch of a SIM pattern of the SIM system based on a characteristic of the substrate pattern;
performing the illuminations of the sample at the substrate with the SIM pattern; and
detecting emissions that the sample generates in response to the illuminations.

17. The method of claim 16, wherein the substrate pattern includes a periodic pattern.

18. The method of claim 17, wherein the pitch of the SIM pattern is selected based on a pitch of the periodic pattern.

19. The method of claim 18, wherein selecting the pitch of the SIM pattern comprises configuring the SIM system with a grating for generating the SIM pattern, the grating corresponding to the pitch of the periodic pattern.

20. The method of claim 19, wherein the grating has a pitch that is between about 1.5 and about 2 times the pitch of the periodic pattern.

21. The method of any of claims 16-20, wherein the sample comprises a biological material, and wherein detecting the emissions comprises detecting fluorescence emitted by the sample in response to the illuminations.

22. A structured illumination microscopy (SIM) system comprising:
a light source;
a light-structuring component to provide light from the light source with a SIM pattern for performing illuminations of a sample at a substrate having a periodic pattern, the light-structuring component configured for rotation of the SIM pattern about an optical axis into modulation angles, and for providing an offset to each of the modulation angles of the SIM system to form offset modulation angles, none of the offset modulation angles corresponding to an angle of a symmetry axis of the periodic pattern; and
an image sensor to detect emissions that the sample generates in response to the illuminations.
23. The SIM system of claim 22, wherein the offset is provided such that each of the offset modulation angles is smaller than the corresponding modulation angle.
24. The SIM system of claim 22, wherein the offset is provided such that each of the offset modulation angles is greater than the corresponding modulation angle.
25. The SIM system of any of claims 22-24, wherein the offset is about 10-30 degrees.
26. The SIM system of claim 25, wherein the offset is about 20 degrees.
27. The SIM system of claim 26, wherein one of the modulation angles is about 45 degrees, and wherein the offset modulation angle corresponding to the one of the modulation angles is about 25 degrees.
28. The SIM system of any of claims 22-27, wherein the periodic pattern comprises nanowells formed at the substrate.
29. The SIM system of claim 28, wherein the periodic pattern comprises that the nanowells are arranged in a square array.
30. The SIM system of claim 29, wherein the square array has the nanowells arranged in linear rows and linear columns, wherein the linear rows are substantially perpendicular to the linear columns.
31. The SIM system of any of claims 28-30, wherein a first nanowell is illuminated by the SIM pattern, wherein a second nanowell is adjacent the first nanowell, and wherein the second nanowell is not illuminated by the SIM pattern when the first nanowell is illuminated by the SIM pattern.
32. The SIM system of any of claims 22-31, wherein the light source includes at least one of a laser or a light-emitting diode.
33. The SIM system of any of claims 22-32, wherein a pitch of the SIM pattern is

based on a pitch of the periodic pattern.

34. The SIM system of claim 33, wherein the pitch of the SIM pattern is between about 1.5 and about 2 times the pitch of the periodic pattern.

35. A method comprising:

configuring a structured illumination microscopy (SIM) system for rotation of a SIM pattern about an optical axis into modulation angles, the SIM system configured for performing illuminations of a sample at a substrate having a periodic pattern;

providing an offset to each of the modulation angles of the SIM system to form offset modulation angles, none of the offset modulation angles corresponding to an angle of a symmetry axis of the periodic pattern;

performing the illuminations of the sample at the substrate with the SIM pattern at the offset modulation angles; and

detecting emissions that the sample generates in response to the illuminations.