## Claims

1. A multimodal microscopy system comprising:

an illumination module configured to provide a light beam to a sample under test via a delivery path, wherein the illumination module is configured to operate between a transmission mode and a reflection mode; and

an optical arrangement configured to receive the light beam from the sample through a detection path to generate a microscopy image of the sample,

wherein the optical arrangement is operable to switch among a plurality of imaging modalities using the detection path shared by the plurality of imaging modalities,

the plurality of imaging modalities comprises brightfield microscopy, fluorescent microscopy, and endoscopic microscopy, and

wherein the optical arrangement comprises:

an objective lens configured to receive the light beam from the sample;

a tunable filter optically coupled to the objective lens, the tunable filter operable to select a specific wavelength and / or intensities or a specify range of wavelengths and / or intensities of the light beam;

a tube lens optically coupled to the tunable filter; and

a microscopy-adaptable camera optically coupled to the tube lens for capturing the microscopy image of the sample.

2. The multimodal microscopy system as claimed in claim 1, wherein the tunable filter is a liquid crystal tunable filter or an acousto-optic tunable filter, and the tunable filter is free from having moving parts.

3. The multimodal microscopy system as claimed in claim 1 or 2, wherein the illumination module comprises

a broadband light source for providing the light beam; and

a light guide optically coupled with the broadband light source for directing the light beam from the broadband light source to illuminate the sample, the illumination module

configured to operate between the transmission mode and the reflection mode when the plurality of imaging modalities is switched to brightfield microscopy;

wherein in the transmission mode, the illumination module further comprises a condenser lens optically coupled with the light guide to provide the light beam from underneath the sample, and

in the reflection mode, the illumination module further comprises collimation optics arranged in the delivery path between the light guide and the objective lens to deliver the light beam from above and onto the sample.

4. The multimodal microscopy system as claimed in claim 3, wherein the collimation optics comprises:

a collimator configured to focus the light beam from the broadband light source; and

a beam splitting member optically coupled to an objective lens.

5. The multimodal microscopy system as claimed in claim 1 or 2,

wherein the illumination module comprises a broadband light source with a filter or a narrowband light source for providing the light beam; and is configured to operate between the transmission mode and the reflection mode when the plurality of imaging modalities is switched to fluorescent microscopy;

wherein in the transmission mode, the illumination module further comprises a condenser lens optically coupled with the broadband light source with the filter or the narrowband light source to provide the light beam from underneath the sample, and

in the reflection mode, the illumination module further comprises a filter cube arranged in the delivery path between the broadband light source with the filter or the narrowband light source and the objective lens to deliver the light beam from above and onto the sample.

6. The multimodal microscopy system as claimed in claim 5, wherein the broadband light source has a wavelength ranging from 200 nm to 419 nm for ultraviolet range, from 420 nm to 730 nm for visible range, and from 731 nm to 1700 nm for near and short-wave infrared range.

7. The multimodal microscopy system as claimed in claim 5 or 6, wherein the filter cube comprises:

a collimator configured to focus the light beam;

an excitation filter optically coupled to the collimator; and

a beam splitting member optically arranged between the tunable filter and the collimator.

8. The multimodal microscopy system as claimed in claim 4 or 7, wherein the beam splitting member comprises a dichroic mirror or a beam splitter.

9. The multimodal microscopy system as claimed in claim 1 or 2,

wherein the illumination module comprises a broadband or narrowband light source for providing the light beam, the illumination module being configured to operate between the transmission mode and the reflection mode and to provide external illumination when the plurality of imaging modalities is switched to endoscopic microscopy;

wherein in the transmission mode, the illumination module further comprises a collimator and a light guide optically coupled with the broadband or narrowband light source to provide the light beam from underneath the sample, and

in the reflection mode, the illumination module further comprises a collimator and a light guide optically coupled to the broadband or narrowband light source placed at an angle to a collection probe to deliver the light beam above and onto the sample.

10. The multimodal microscopy system as claimed in claim 9, wherein the collection probe comprises a proximal end optically coupled to the objective lens, and a distal end opposite to the proximal end, the distal end through which the light beam from the sample is to be received via the detection path; and wherein the multimodal microscopy system further comprises a three-axis stage configured to adjust a position of the proximal end of the collection probe relative to that of the objective lens.

11. The multimodal microscopy system as claimed in claim 1 or 2,

wherein the illumination module comprises:

a broadband or narrowband light source for providing the light beam, the illumination module being configured to provide internal illumination in the reflection mode when the plurality of imaging modalities is switched to endoscopic microscopy; and

a fiber probe comprising at least one optical fiber having a proximal end optically coupled to the broadband or narrowband light source, and a distal end opposite to the proximal end, the

distal end having a metasurface through which the light beam is to be directed above and onto the sample.

12. The multimodal microscopy system as claimed in claim 11, wherein the fiber probe further comprises a collection probe having a proximal end optically coupled to the objective lens, and a distal end opposite to the proximal end, the distal end through which the light beam from the sample is to be received via the detection path.

13. The multimodal microscopy system as claimed in claim 12, wherein the distal end of the collection probe is coupled to an optical component for focusing to facilitate non-contact imaging and on-axis focusing.

14. The multimodal microscopy system as claimed in claim 13, wherein the optical component for focusing is a gradient-index lens, or a ball lens, or is provided by the metasurface.

15. The multimodal microscopy system as claimed in any one of claims 12 to 14, wherein the proximal end of the collection probe is arranged along an imaging plane substantially same as that of the objective lens.

16. The multimodal microscopy system as claimed in any one of claims 12 to 15, further comprising a three-axis stage configured to adjust a position of the proximal end of the collection probe relative to that of the objective lens.

17. The multimodal microscopy system as claimed in any one of claims 3, 9 to 16, wherein the broadband light source has a wavelength ranging from 420 nm to 730 nm for visible range and 731 nm to 1700 nm for near and short-wave infrared range.

18. The multimodal microscopy system as claimed in any one of claims 3, 4, 9 or 10, wherein the light guide is a liquid light guide, a single mode optical fiber, or a multi-mode optical fiber.

19. The multimodal microscopy system as claimed in any one of claims 1 to 18, wherein the microscopy-adaptable camera is a monochrome complementary metal-oxide-semiconductor camera or a monochrome charged-coupled device camera.

20. The multimodal microscopy system as claimed in any one of claims 1 to 19, wherein the system is a multimodal hyperspectral microscopy system.