Claims

1. A system for generating a mid-infrared (MIR) light, the system comprising:
   a first laser source configured to provide an infrared light having a wavelength selected from a range from 1 μm to 2.5 μm;
   a second laser source configured to provide a further light having a wavelength shorter than the wavelength of the infrared light provided by the first laser source;
   an optical element configured to combine the infrared light provided by the first laser source and the further light provided by the second laser source into a combined light;
   a first gas cell configured to hold a gas;
   a second gas cell configured to hold the gas; and
   a hollow core fiber in fluidic communication with the first gas cell and the second gas cell such that the hollow core fiber is also configured to hold the gas;
   wherein the hollow core fiber when filled with the gas is configured to emit the mid-infrared (MIR) light in response to the combined light being provided to the hollow core fiber, the mid-infrared (MIR) light having a wavelength in a mid-infrared range.

2. The system according to claim 1,
   wherein the mid-infrared (MIR) light comprises mid-infrared (MIR) pulses.

3. The system according to claim 1 or claim 2,
   wherein the wavelength of the mid-infrared (MIR) light is inversely proportional to the wavelength of the further light.

4. The system according to any one of claims 1 to 3,
   wherein the wavelength of the further light is of a value selected from a range from 0.6 μm to 1.7 μm.

5. The system according to any one of claims 1 to 4,
   wherein the further light is a near infrared (NIR) light.

6. The system according to any one of claims 1 to 5,
wherein the wavelength of the mid-infrared (MIR) light is directly proportional to a gas pressure of the gas in the hollow core fiber.

7. The system according to any one of claims 1 to 6,
wherein a diameter of a core of the hollow core fiber is of a value selected from a range from 60 μm to 140 μm; and
wherein a thickness of a cladding of the hollow core fiber is of a value selected from 1.2 μm to 3.2 μm.

8. The system according to any one of claims 1 to 7,
wherein the mid-infrared (MIR) light is generated via degenerate four-wave-mixing (DFWM).

9. The system according to any one of claims 1 to 8,
wherein the optical element is a dichroic mirror, a wavelength-division multiplexer, a dispersion grating, or a cube beam splitter.

10. The system according to any one of claims 1 to 9, further comprising:
a delay line arranged either along a first optical path, the first optical path being a transmission path taken by the infrared light from
the first laser source to the optical element, or along a second optical path, the second optical path being a transmission path taken by the further light from the second laser source to the optical element.

11. The system according to claim 10, further comprising:
a first set of optical elements arranged along the first optical path for controlling an input energy of the infrared light provided by the first laser source; and
a second set of optical elements arranged along the second optical path for controlling an input energy of the further light provided by the second laser source.

12. The system according to claim 11,

wherein the first set of optical components comprises a half-wave plate and a polarizer; and

wherein the second set of optical components comprises a half-wave plate and a polarizer.

13. The system according to claim 11 or claim 12, further comprising:

a mirror along the second optical path, the mirror configured to direct the further light towards the optical element.

14. The system according to any one of claims 1 to 13, further comprising:

a focus or collimate lens configured to focus the combined light onto within the hollow core fiber or collimate the combined light for transmission.

15. A method of forming a system for generating a mid-infrared (MIR) light, the method comprising:

providing a first laser source configured to provide an infrared light having a wavelength selected from a range from 1 μm to 2.5 μm;

providing a second laser source configured to provide a further light having a wavelength shorter than the wavelength of the infrared light provided by the first laser source;

providing an optical element configured to combine the infrared light provided by the first laser source and the further light provided by the second laser source into a combined light;

providing a first gas cell configured to hold a gas;

providing a second gas cell configured to hold the gas; and

arranging a hollow core fiber to be in fluidic communication with the first gas cell and the second gas cell such that the hollow core fiber is also configured to hold the gas;

wherein the hollow core fiber when filled with the gas is configured to emit the mid-infrared (MIR) light in response to the combined light being provided to the hollow core fiber, the mid-infrared (MIR) light having a wavelength in a mid-infrared range.