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CLAIMS:

1. An optical spectroscopy probe comprising:
 - a probe head having a first attachment portion with at least one component having a first shape;
 - 5 a sample optic subassembly that is removably attachable to the probe head, the sample optic subassembly comprising:
 - a second attachment portion that is proximal to the probe head and has at least one component with a second shape that is complimentary to the first shape for releasably
 - 10 engaging the first attachment portion; and
 - a locking mechanism to hold the sample optic subassembly and the probe head together and constrain relative motion therebetween along at least five degrees of freedom.
2. The optical spectroscopy probe of claim 1, wherein the first attachment
15 portion of the probe head comprises a socket with a cross-sectional shape and the second attachment portion of the sample optic subassembly comprises a sample optic tube with a proximal portion that has a same cross-sectional shape as the socket portion and slidably engages the socket portion.
3. The optical spectroscopy probe of claim 2, wherein the locking
20 mechanism comprises:
 - a groove on a first portion of an exterior surface of the sample optic tube and a socket recess at a second portion of the exterior surface of the sample optic tube;
 - first and second nodes on a first portion of an interior surface of the
25 socket of the probe head that are positioned to mate with the groove on the sample optic tube;
 - a channel through a second portion of the socket that is aligned with the socket recess of the sample optic tube; and
 - a fastener that engages the channel to hold the sample optic tube fixed
30 to the socket of the probe head.

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4. The optical spectroscopy probe of claim 2, wherein the locking mechanism comprises:

first and second nodes on a first portion of an exterior surface of the sample optic tube and a socket recess at a second portion of the exterior

5 surface of the sample optic tube;

a groove on a first portion of an interior surface of the socket of the probe head that are positioned to mate with the first and second nodes on the sample optic tube;

10 a channel through a second portion of the socket that is aligned with the socket recess of the sample optic tube; and

a fastener that engages the channel to hold the sample optic tube fixed to the socket of the probe head.

5. The optical spectroscopy probe of claim 3 or claim 4, wherein the channel is a threaded channel, and the fastening member is a screw with an
15 end that is shaped to releasably engage the threaded channel of the socket of the probe head and engage the socket recess of the sample optic tube.

6. The optical spectroscopy probe of claim 3 or claim 4, wherein the fastening member is a pin with an end that is shaped to releasably engage the channel of the socket of the probe head and engage the socket recess of the
20 sample optic tube.

7. The optical spectroscopy probe of any one of claims 3 to 6, wherein the first and second nodes are conical.

8. The optical spectroscopy probe of claim 1, wherein the first attachment portion of the probe head comprises a first tube and the second attachment
25 portion of the sample optic subassembly comprises a sample optic tube that is adapted to slidably engage the first tube of the probe head in a coaxial fashion.

9. The optical spectroscopy probe of claim 8, wherein the sample optic tube is sized to slide over the first tube of the probe head.

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10. The optical spectroscopy probe of claim 8 or claim 9, wherein the sample optic tube has a socket at a proximal end portion thereof and a tip of the first tube of the probe head is adapted to mate with the socket of the sample optic tube to prevent the tip of the first tube from moving laterally or moving along an optical axis of the sample optic subassembly.
11. The optical spectroscopy probe of any one of claims 8 to 10, wherein the locking mechanism comprises a slot and a key section with a rib where the rib is sized to mate with the slot to establish a single fixed rotational orientation between the first tube of the probe head and the sample optic tube.
12. The optical spectroscopy probe of claim 11, wherein the slot is located on a proximal portion of the sample optic tube and the key section is located on a distal portion of the first tube of the probe head.
13. The optical spectroscopy probe of claim 11, wherein the slot is located on a distal portion of the first tube of the probe head and the key section is located on a proximal portion of the sample optic tube.
14. The optical spectroscopy probe of any one of claims 1 to 13, wherein the locking mechanism is adapted to hold the probe head and the sample optic subassembly in place to prevent lateral shifting of the sample optic subassembly relative to a collimated beam that is generated by the optical spectroscopy probe during use.
15. The optical spectroscopy probe of any one of claims 1 to 14, wherein the locking mechanism is adapted to hold the probe head and the sample optic subassembly in place to prevent rotation of the sample optic subassembly relative to the probe head.
16. The optical spectroscopy probe of any one of claims 1 to 15, wherein the first and second attachment portions are shaped to restrict movement along at least two axes and to restrict rotation around all three axes, and the locking mechanism is adapted to hold the probe head and the sample optic

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subassembly in place so that after the sample optic subassembly is removed, the sample optic subassembly is reinstallable in a position such that the optical alignment of the optical spectroscopy probe is substantially the same as before removal of the sample optic assembly.