perspective views of the chamber of the present invention. FIGS. **3–6** presents two-dimensional side, top, bottom, front, and back views of the humidity chamber.

The chamber of the present invention is preferably constructed of Teflon. The top of the chamber **1** is open to allow insertion of the AFM scanning head assembly. The opening (port) **2** is uniquely geometrically configured so as to envelope the head and provide a snug and essentially air tight fit while allowing normal operation of the AFM. A snug and essentially air tight fit is achieved through the use of a precisely-sized opening **2** relative to the AFM scanning head assembly, and/or a rubber membrane or gasket (not shown). A side-entry port **4** at the left side of the chamber allows for insertion of the AFM optical microscope objective lens (camera). A rubber membrane or gasket **5** is provided around the camera port **4** in order to facilitate a snug and essentially air tight fit here also, while allowing normal operation of the AFM. The rubber membrane or gasket **5** can be held in place by use of a membrane retainer plate **6** and screws **3**, as shown in FIG. **1**, or any other suitable means.

The chamber of the present invention can be used with any type of AFM, or microscope generally, so long as ports **2** and **4** are adapted to conform to the particular AFM or microscope to provide a snug and essentially air-tight fit while allowing normal operation of the AFM or microscope. The overall dimensions of the humidity chamber are not critical. However, because the humidity chamber "sits" on the stage of the AFM or microscope, the overall dimensions of the humidity chamber are limited by the constraints of the particular AFM or microscope selected. In one embodiment, for instance, the top of the chamber includes an optional lip **22** which matches a lip on the head of the scanned-stylus AFM described in U.S. Pat. Nos. 6,032,518; 5,714,682; 5,560,244; and 5,463,897.

The right side **7** of the humidity chamber of the present invention is adapted to allow the use of a commercially available humidity sensor (not shown), such as the Thin-Film Capacitance Sensor manufactured by Vaisala, and a commercially available humidity generator (not shown), such as the humidity generator manufactured by VTI Corporation. Specifically, the chamber is adapted to include means for receiving and retaining signals from the humidity sensor, the means preferably being, but not limited to, a two-wire cable **8** which can take humidity readings from the chamber and transmit the readings to the humidity generator. Such a cable ("a humidity sensor") is generally included as part of commercially available humidity sensing devices. The chamber is adapted to receive the humidity sensor **8** securely.

A secure attachment of the humidity sensor **8** to the chamber is facilitated by the use of a mounting mechanism constructed of a block **11** of Teflon, or other suitable material, which is attached to the side of the chamber by screws **12**, and which includes a threaded hole (not shown) adapted to allow the threaded end **21** of the humidity sensor **8** to be screwed in place. The use of such a mounting mechanism is preferable due to the thinness of the walls of the humidity chamber. Other suitable mounting means, of course, would be within the scope of the present invention and might be more appropriate depending on the configuration of a particular humidity sensor.

The right side of the chamber is constructed to allow for attachment of a conditioned air input **9** tube and a conditioned air output **10** tube from a commercially available humidity generator (tubes are not shown). Attachment can be facilitated by any appropriate means, such as the use of appropriately sized hose-barbs **9** and **10** as shown in FIGS. **1–6**. Other appropriate attachment mechanisms would include screws, or the like.

In a preferred embodiment, the present invention includes an integrated sample platform and a spring loaded base-plate. Specifically, the bottom **13** of the chamber includes a sample porthole **15** and one or more compression springs **14** mounted to the bottom of the chamber, one on each side of the sample porthole **15**. The sample porthole **15** is appropriately shaped to facilitate insertion of a separate sample platform **16**. The sample platform **16** contains a sample stage **20** which extends up from a base-plate **17** and which can be inserted into the chamber via the sample porthole **15**. The base-plate **17** of the sample platform **16** is of an appropriate size so as to be able to "sit" on the stage (not shown) of the selected AFM or microscope.

The sample stage **20** is adaptable for particular types of samples (not shown). The sample can be set on the sample stage **20** after the sample platform **16** is inserted in the sample porthole **15** and the locking clip **19** is in place over the sample porthole **15**, thereby allowing for samples to be loaded and unloaded without removal of the entire chamber. Obviously, the AFM, or microscope, head assembly is not in the chamber at the time of the insertion of the sample. Preferably, the AFM optical microscope objective lens, or camera, is also not in place in the side-port **4** at the time of the insertion of the sample. Alternatively, after the chamber is secured to the AFM, or microscope, head assembly, the entire chamber-head assembly unit can be raised up by raising the head assembly in the normal fashion, and a the sample stage **20** dropped out for insertion of a new sample.

The upper portion of the sides of the sample porthole **15** include cut-outs (or grooves) **18** configured to facilitate insertion of a separate retaining clip **19** (a "locking clip" **19**) which, when in place, locks the sample platform **16** into the sample porthole **15**. After the sample platform **16** is inserted in the sample porthole **15**, the locking clip **19** is inserted over the sample porthole **15**, such that the notched portions **30** of the locking clip **19** are inserted in the cut-outs **18** of the sample port-hole **16** thereby holding the sample platform **16** in place. The sample stage retaining clip **19** can be made of any suitable material, such as stainless steel. The base-plate **17** of the sample platform **16** can optionally include a magnet (not shown) attached to the base-plate **17** to assist in securing the sample platform **16** to the sample porthole **15** prior to insertion of the locking clip **19**. In an alternative locking mechanism, the upper 0.1875 in. of the sample platform has a larger diameter than the lower 0.375 in. (see FIG. **8**). This feature allows an alternative u-shaped locking pin (not shown in the figures), to be inserted into edge notches in the porthole (see FIG. **7**), thereby keeping the sample platform from falling back out of the chamber.

When the sample stage retaining clip **19** is in place, the compression springs **14** are slightly compressed, and the base-plate **17** of the sample platform **16** is a distance apart from the base **31** of the chamber. The compression springs **14** act to keep the sample platform **16** from moving further up into the chamber. However, additional force can be applied to the base-plate **17** of the sample platform **16** to move the sample platform further up into the chamber. Alternatively, the sample platform **16** can move up from the point where the sample stage retaining clip **19** holds the sample platform **16** in the chamber, at which time the base-plate **17** of the sample platform **16** will come into contact with the bottom edge **32** of the sample porthole **15** and the compression springs **14** will be almost fully compressed.