PicoLE Liquid Cell User's Manual

v1.0

Molecular Imaging

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Sample Plate

The purpose of the sample plate is to hold the sample and offer greater X and Y translation ranges than those of the scanner X and Y piezos. The sample plate and liquid cell are used in both AFM and STM operations, with some sample plates equipped for temperature control and MAC mode – contact Molecular Imaging for additional information.

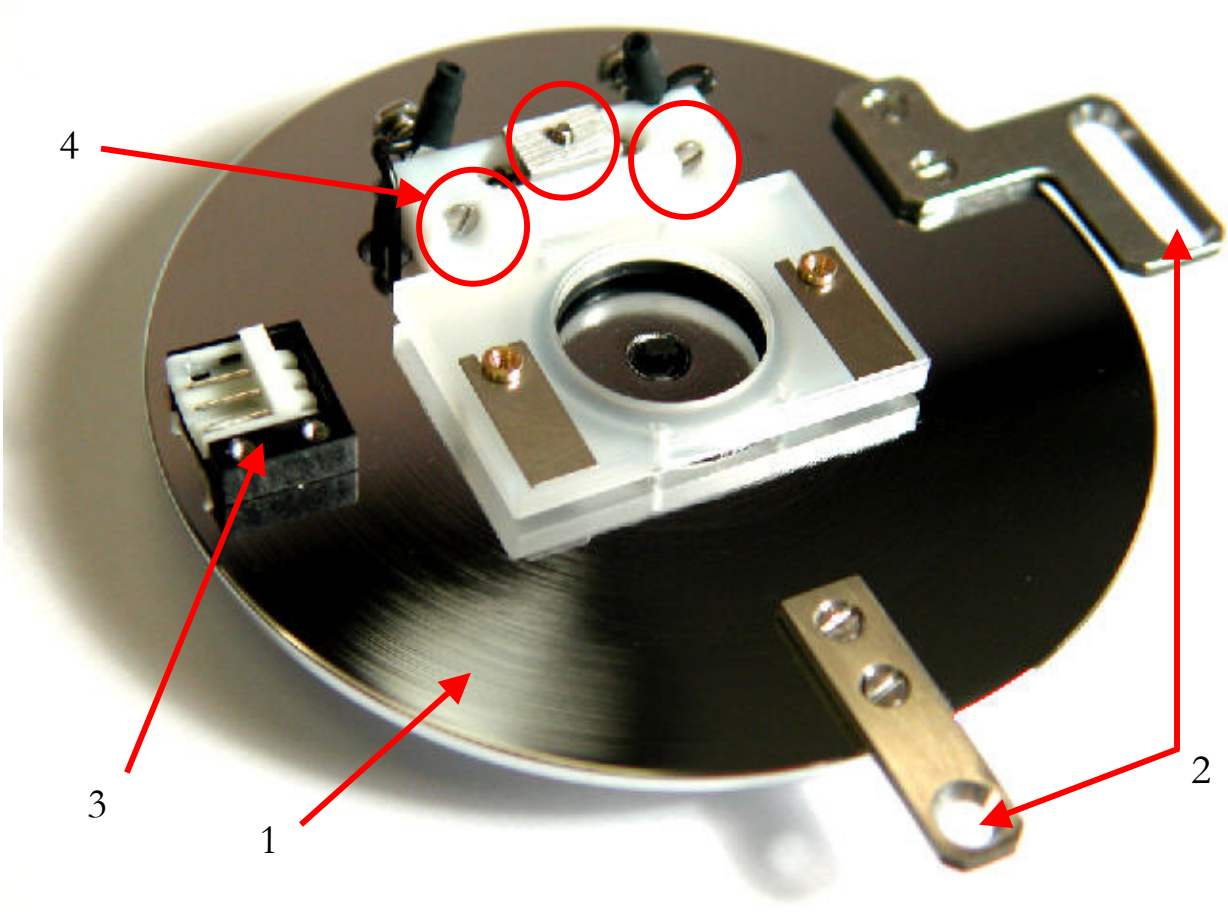

Figure 1 (sample plate with liquid cell in place)

1. **Sample Plate**: Disk that is suspended from the ends of the motor screws by magnetic support.
2. **Translation Holes**: These engage the translation pegs, which adjust the stage in the X and Y directions. These pegs are adjusted via the translation screws on the microscope body.
3. **EC Connector**: This provides connections for the sample bias and for electrochemistry.
4. **Electrode Connectors**: As shown from left to right in Figure 1 above, the connectors correspond to the reference, working, and counter electrodes. To connect the working electrode (WE), push the screw up from underneath and insert the long part of the electrode under the metal plate. To connect the reference and counter electrodes (RE and CE), push the pogo screws forward and insert the shorter end of the electrode.

Liquid Cell Components

The liquid cell is an important component of both AFM and STM imaging. It allows for experiments to be imaged in-situ, offering better control under more realistic environments.

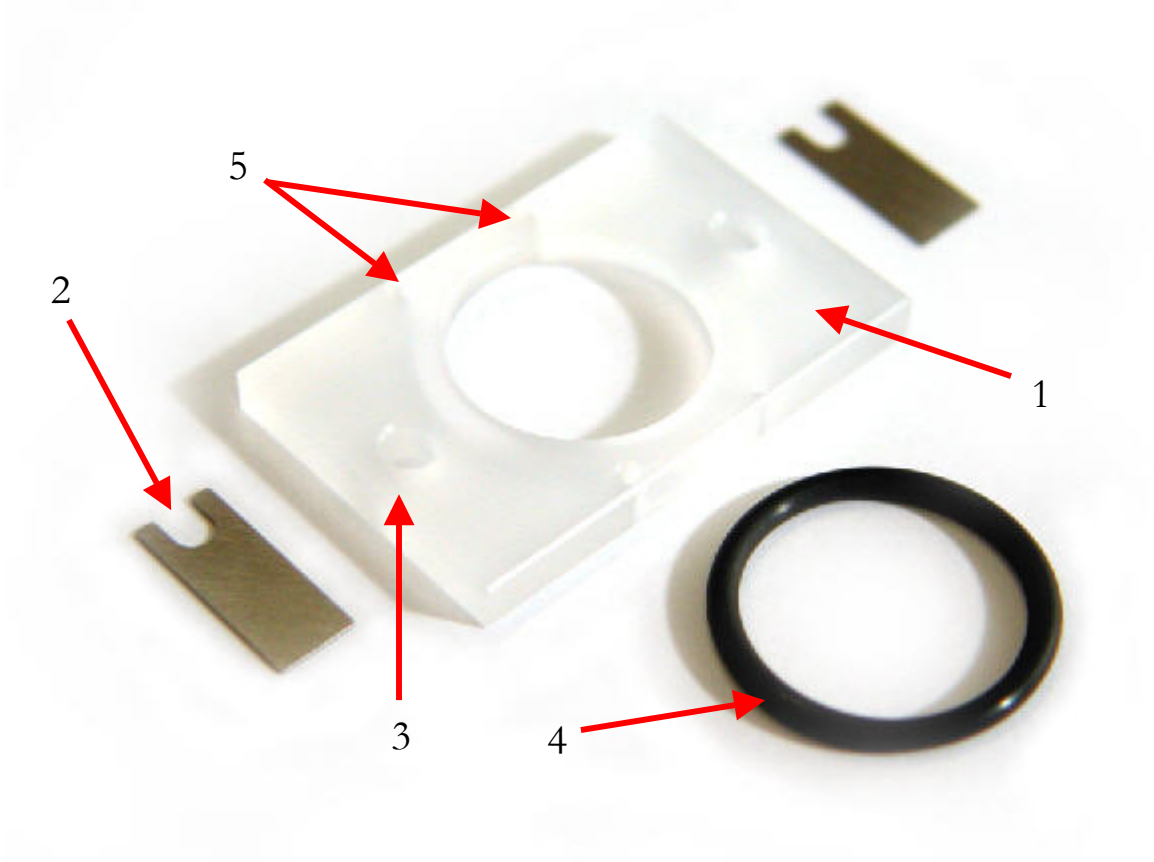

Figure 2 (Liquid cell components)

1. **Liquid Cell Plate**: This is the main component of the liquid cell. It, along with the O-ring, comprises the sides of the liquid container. The bottom of this container is the sample itself. Therefore, the sample must be large enough for the O-ring to seat.
2. **Retaining Clips**: These hold the liquid cell in place in conjunction with the retaining pins on the sample plate. Push the pins up through the liquid cell plate and place the end of the clip in the groove of the retaining pins.
3. **Retaining Pin Holes**: The retaining pins on the sample plate pass through these holes.
4. **O-Ring**: This keeps liquid from leaking out from underneath the liquid cell plate. It fits in a seat on the underside of the liquid cell plate. The bottom of the O-ring seals against the sample itself.
5. **Contact Holes**: Though difficult to see in this image, there are four small holes through the face of the liquid cell plate. These holes allow electrodes (usually the WE) direct contact with the sample, while keeping them isolated from the liquid (only two of the four holes are indicated by the arrows in Figure 2 above). There are four holes to facilitate electrode placement regardless of the liquid cell's orientation.

Liquid Cell Assembly

Steps 1 – 3 below are the same as the procedure for **Placing the Sample** in the **System** module.

1. Prepare and load the sample as desired. The standard translatable sample plate has a magnetic core that will securely hold any samples mounted on magnetic backings. Typically when using the liquid cell, it holds the sample in place.

2. Place the sample plate in position on the underside of the microscope. The plate will "clip" into place as the magnets hold the plate to the adjustment screws. If using the translation pegs, be sure that they pass through the translation holes on the sample plate.

3. Adjust the screws to bring the sample close to the cantilever with the sample plate as level as possible.

4. Remove the sample plate from the microscope.

5. Place the O-ring concentricly on the sample plate.

6. Place the liquid cell (O-ring seating side down) onto the O-ring so that the two spring-loaded pins on the sample plate align with the two holes in the liquid cell.

7. Push one of the pins up (using a finger) through the sample plate.

8. Slide one of the retaining clips across the top of the liquid cell until it catches the groove in the top of the pin. See Figure 1 above.

9. Repeat steps 7 and 8 for the remaining pin.

10. Add the desired liquid to the liquid cell, submerging the sample.

11. Carefully reattach the sample plate to the magnetic plungers with the liquid cell in place. The laser spot on the screen will move forward when the cantilever is submerged.

Notes

1. It is important that the liquid cell lies flat on the sample plate, to prevent the cell from leaking.
2. The retaining pins on the sample plate can be adjusted for various tensions by using a flat head screwdriver.
3. If using a hot or cold MAC mode plate, be certain not to place a sample directly onto the plate, because the ferrite core could react in solution or when in contact with the sample. It is recommended that a glass cover slip be used.
4. Flow-through liquid cells are also available for fluid lines to be attached directly.
5. Loading the sample plate with a liquid cell for AFM imaging can be difficult due to the size of the cantilever holder. BE CAREFUL: When loading the sample plate with a liquid cell, do not hit the cantilever on the cell. Also, be certain that the cantilever holder is not touching the liquid cell once engaged, as this could lead to excessive drift.