Specifications for

A 6-inch Substrate Heater Unit for Sputtering System

A 6-inch substrate heater unit is required for epi-layer research, thin film deposition process. The substrate heater unit is a crucial part of epitaxial layer growth system and shall meet or exceed the following specifications:

1. The substrate heater unit shall include a substrate module with a 6-inch substrate holder, a 6-inch sample clamping, a rotation module, a home position searching, a 7-inch heater module, and a bias module. (Figure 1)
   - The 7-inch substrate heater module shall heat up to 1000°C. The 7-inch heater element shall ensure the repeated cycles of heating operation.
   - The gap between the substrate holder and substrate heater shall be small enough to prevent heat loss using spring clamping.
   - The rotation module shall include a vacuum-tight ferrofluid seal and DC motor for substrate rotation.
   - The 7-inch heater module shall include heater power feedthrough, cooling block, thermal shield, and insulation pipe and electrode.
   - The bias module shall include bias power feedthrough, bias wheel and bias ring.
2. All components shall be made of material withstanding 1000°C temperature or chill water-cooled. (Figure 2)
3. The gap between the substrate holder and substrate heater shall be small enough using 'spring clamping mechanism' with welded bellows, cylinder, and spring and LM ball bush.
   - The spring shall maintain its spring constant at high temperature (~1000°C) .
4. The parts shall include substrate controller with realty for system interlock, rotation control, heater control, sample clamp module, and power transformer. (Figure 1)
   - The rotation control shall include rotation home sensor facing the blank edge of the clamp to the load lock system to move sample holder with wafer from end-effector to substrate holder.
   - The rotation control shall also include DC motor for the rotation of substrate holder.
   - The heater controller shall include Ampere meter, Volt meter, temperature controller, k-type thermocouple sensor.
   - The sample clamp module shall include clamp up/down sensor and air sol valve.

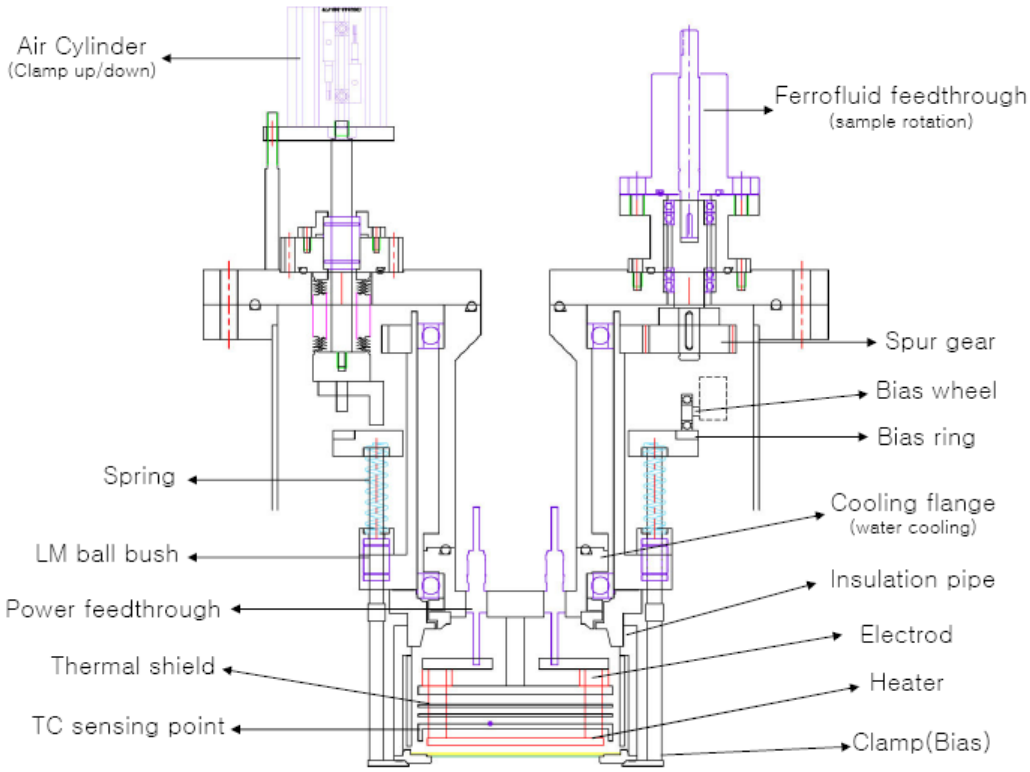

Figure 1. Schematic diagram of modified substrate module system of the existing chamber

5. The parts shall include sample holder for a 6”-diameter round-shape wafer and sample End-effector to carry 6” sample holder with loading type. (Figure 3)
   - The configuration and dimensions of new sample End-effector may be changed and designed by the final supplier as long as it could move through the 8-inch entry rectangular port load lock chamber system.
   - The other (opposite) side of the End-effector shall fit the end of the linear driver of the 8-inch entry rectangular port load lock system. (Please review the dashed area of the attached information of the current load lock)
   - The material of the sample End-effector shall be A16061.

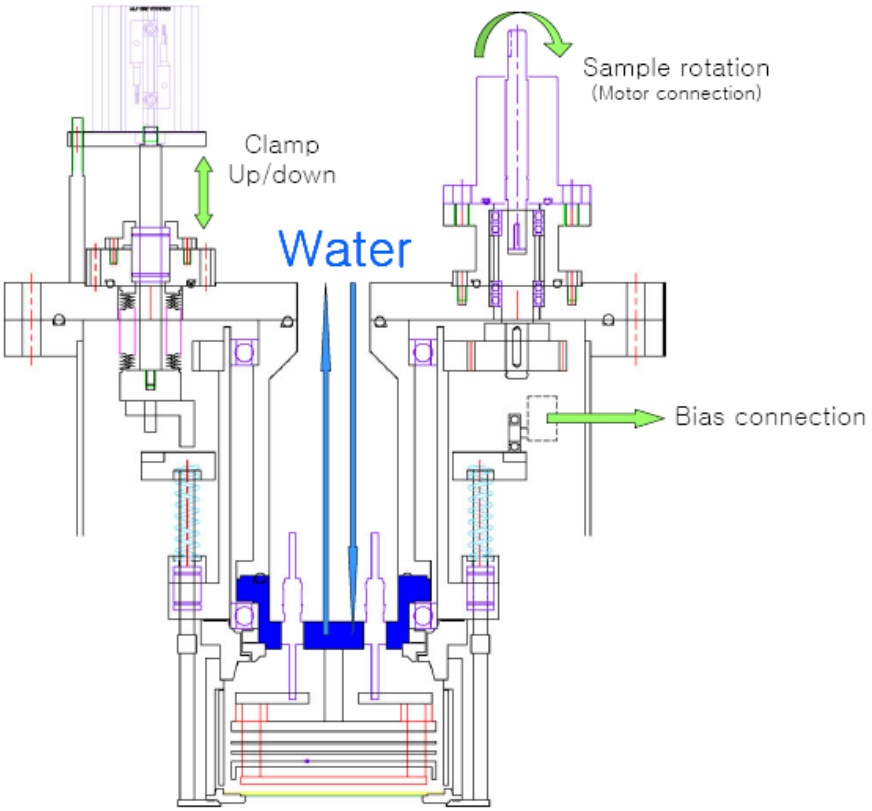

Figure 2. Schematic diagram of cooling process with water-cooling loop

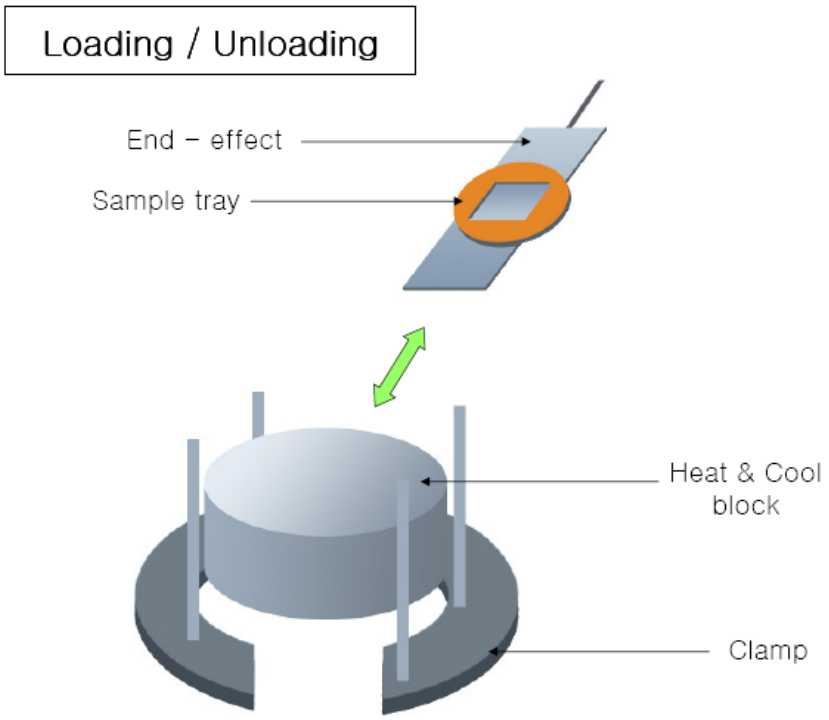

Figure 3. Schematic diagram of loading/ unloading process of 6-inch sample holder between current load lock chamber system and substrate holder with sample

6. Substrate Nipple shall have metal seal type (CF: conflat) for copper gasket seal. This is the base plate where a Substrate Module with a 6-inch substrate fixture, a Heater Module with 7-inch heating element, and a Rotation Module are built on.

7. On-site installation & maintenance

   The supplier shall have a 1-year warranty with on-site maintenance.

8. Shipping and packaging

   All system, component, items, and services shall be delivered to the NASA Langley Research Center within 40 days after the purchase order is awarded.