HARE SQ Dispensing and Handling Techniques

Abstract: Epoxy based resist systems such as the HARE SQ system are designed for MEMS and microfluidics applications as a permanent material designed to remain within the device. The SQ resist is coated to film thicknesses varying from less than 2 um to greater than 100 um, with solution viscosities ranging from less than 100 cP to greater than 20000 cP, as shown in the chart below. This document will introduce various techniques for SQ resist handling and dispensing in order to produce uniform, defect free coatings.

	HARE SQ 2	HARE SQ 5	HARE SQ 10	HARE SQ 25	HARE SQ 50
Visc (cP)	43	240	825	2450	8800

Handling: In general, the handling of the SQ resists in terms of pouring, transferring, etc. are similar to most photoresist systems. However, given the relatively high viscosities encountered with the thicker materials, specific handling procedures are recommended.

Avoidance of bubbles within the resist is paramount to yielding clean coatings. It is important to avoid shaking or excessively agitating the resist solution. In the event that bubbles appear in a typical resist, it is necessary to wait for the bubbles to clear before coating the resist. However, the SQ resist chemistry can be safely heated to temperatures upwards of 50C, which reduces the solution viscosity and allows the bubbles to more easily dissipate from the resist solution. Note that in order to obtain desired film thicknesses, the resist solution must be allowed to equilibrate to ambient temperature before use.

Storage: The SQ resist series shows excellent resistance to temperature extremes in terms of performance and shelf life. It is recommended however that for best performance and resist life that the material be stored at room temperature.

Dispense: The major concern with SQ resist dispensing is similar to that of resist handling, minimization of bubble formation within the resist.

In situations where the resist is stored in a large volume container, generally 500ml or larger, it is recommended that the resist be transferred into a smaller secondary container of 50 to 100ml volume. This will not only make dispensing easier, but will minimize contamination of the larger resist volume. Transfer of this material should be performed as described in the handling section above.

In small volume, laboratory environments, pouring directly from the bottle to the wafer surface is often the best way to insure no bubbles in the resist puddle. It is also important to dispense the resist to the center of the wafer to insure uniform spreading of the material upon spinning. The use of pipettes to dispense can cause bubbles if extreme care is not taken during dispensing. For viscosities greater than 500 cP, it is recommended that pipettes be avoided.

Larger scale, high volume environments require the use of resist pumps and filters to adequately dispense the resist onto the wafer surface. It is recommended that high viscosity pumps, and sufficiently large filters be used to prevent the formation of bubbles in the dispense stream of the SQ resist. Specific pumps and recipes will vary with the resist viscosities. It is suggested that the user contact the pump manufacturer for specific recommendations.

Coating: Coating of the resist is similar to most resist processes. However, in order to obtain very thick films, greater than 100 um, it is necessary to spin the wafer much slower than ideal, generally in the range of 500 to 1000 rpm. While coating at these spin speeds are possible, uniformity and coverage will be more difficult than at typical spin speeds of 1500 to 2000 rpm, and will likely require a greater volume of resist.

Summary: While the HARE SQ requires some care in handling and dispensing it is not dramatically different than most higher viscosity photoresist systems. Avoidance of bubbles is the major concern, as well as selecting the correct solids and viscosity material for the desired thickness. The HARE SQ has advantages over traditional DNQ resists as it can be heated above room temperature without degradation of the resist performance.