

Vapor Priming vs. Wet Coating

07/17/15

Why Vapor Priming?

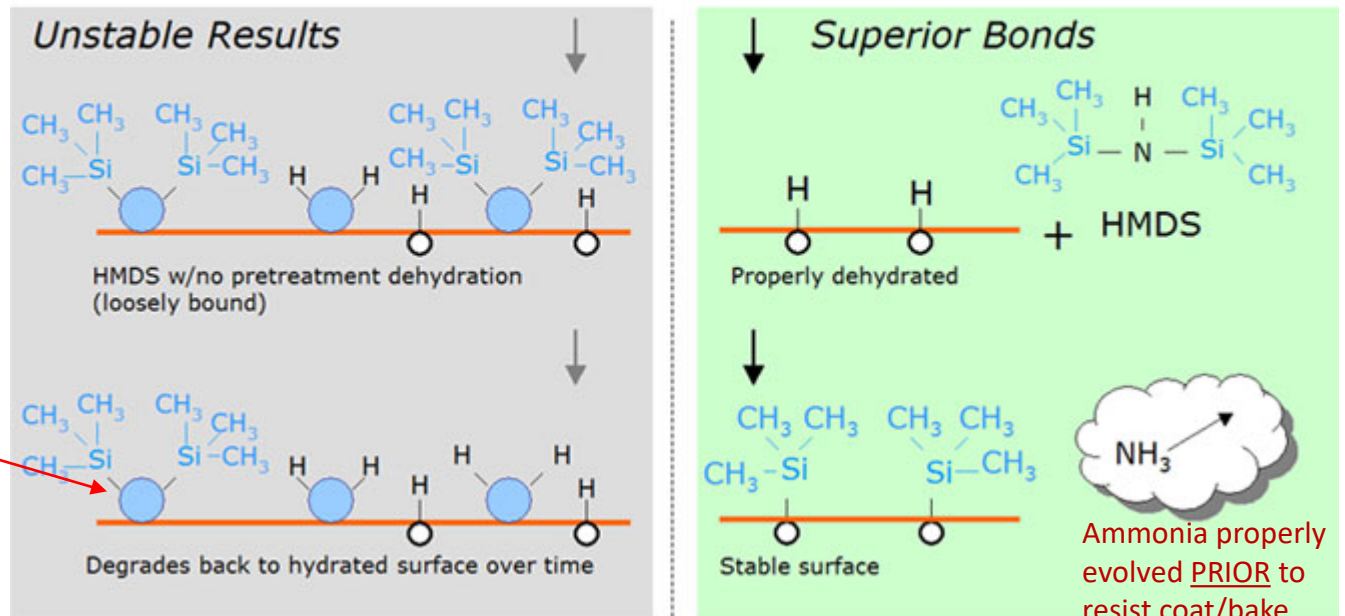
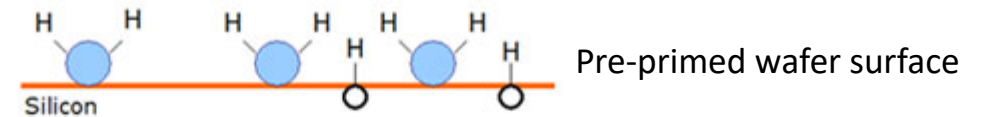
In wafer fabrication, silane deposition is needed to promote the chemical adhesion of an organic compound (photoresist) to a non-organic substrate (wafer). The silane acts as a sort of "bridge," with properties that will bond to both the photoresist and wafer surface. Typically, hexamethyldisilazane (HMDS) is used. HMDS only works well on surfaces that have oxides or OH-groups.

Old wet spin coating processes for depositing silane generated a substantial amount of hazardous waste. Plus, the coating had a limited lifespan, meaning a process engineer had a small window of time to apply photoresist before the bond would degrade.

But today, using the HMDS prime process, you can significantly extend time available between process steps. Plus, chemical usage for a vapor deposition process is typically less than 1% of the amount needed for wet application processes, significantly reducing waste and chemical costs.

Dehydration Prior to Prime is Crucial

In order to promote a strong silane bond to the substrate, first, wafers must be completely dehydrated—not only surface moisture, but the chemically bound water molecules as well. To achieve this, a vapor prime oven combines heat with low pressure. Once dehydrated, wafers are then primed with an HMDS vapor to strengthen photoresist adhesion. Properly treated wafers will last for weeks with no change to surface adhesion.



Also, when spin coating HMDS followed by photoresist coat, the excessive un-bonded HMDS will evolve ammonia into the photoresist at the substrate interface during the resist soft-bake cure. This ammonia (NH₃) will neutralize the PAG in the resist and will cause a thin film of undeveloped resist. This will cause significant variation in photoresist processing depending on application technique, time between prime and resist coat, and humidity.

Method to Apply HMDS without a VP oven

Vapor phase priming of wafers is the best surface treatment for resist adhesion but, since we do not have a vapor prime oven at the current time, follow these simple steps to prime wafers via spin coating:

1. Set a hotplate for 120C
2. Pre-bake your wafer or piece for 30 seconds (for dehydration)
3. Spin coat the HMDS on the wafer
4. Bake HMDS coated wafer at 120C for 60 seconds (drives off un-bonded HMDS)
5. Clean spin bowl and chuck with IPA and dry PRIOR to coating the photoresist (prevents residual HMDS liquid and/or vapors from attaching to the resist during resist coat)
6. Coat photoresist as per your process conditions

This procedure is NOT ideal but it is the best method to prevent the spin coated HMDS from negatively effecting your resist processes.