



Revised September 2008

## PRODUCT BULLETIN

## VM-651 and VM-652 Adhesion Promoters

### Introduction

VM-651 is an organosilane, which is used to improve the adhesion of all types of HD Microsystems polyimide coatings to substrates such as silicon dioxide, or silicon nitride coated wafers. VM652 is a solution of this organosilane in an organic solvent. These products are easy to apply and effective at very low organosilane concentrations. Among all the organosilanes that possess either amino or epoxy groups,  $\alpha$ -amino propyltriethoxysilane (the active ingredient in VM-651 and VM-652) was found to give the best and most consistent overall results. **VM-651 is a concentrate, which must be diluted before application.**

### Effectiveness

The adhesion strength of polyimide to silicon and oxide substrates is maintained for greater than 400 hours in a pressure cooker when either VM-652 or diluted VM-651 are used as adhesion promoters. The adhesion is not affected when the concentration of VM-651 is varied between 0.01% and 0.1%. Although good adhesion is obtained by air-drying, some products show increased adhesion with baking at 110 – 130°C.

Experimental results indicate that only a monomolecular layer is needed to promote adhesion. These results indicate that a Si-O bond is formed with the substrate. Adhesion results are sensitive to the number of bonding sites on the substrate surface. For example, adhesion to silicon dioxide is typically superior to adhesion on silicon nitride. These promoters are not effective with substrates that do not form any native oxide.

### Preparation of VM-651 Solutions

**VM-651 as received must be diluted to effectively react with the wafer surface.** The recommended concentration is 0.1%. In some special cases it maybe helpful to reduce or exceed this concentration. Please consult your HDM Technical Representative should you have any questions

To prepare a VM-651 water solution, the following steps are suggested:

1. Make a 0.1% solution of VM-651 in deionized water. (In 999 ml DI water, add 1 ml VM-651.)
2. Shake the solution very well.
3. Solutions of VM-651 should always be used immediately.
4. Discard after 24 hours and prepare fresh batch. Do not use material older than 24 hours; poor adhesion may result.

### Application

Flood the wafer surface with the adhesion promoter solution: either the diluted VM-651 (see above) or VM-652 as received. It is suggested that the solution be filtered through a 0.2 micron filter at the time of application. Allow the puddle to stand on the wafer for 20 seconds. Spin dry at 2000 to 3500 rpm for 30 seconds. No bake is required, however adhesion may be improved on difficult substrates by baking at 105 - 130°C for one minute on a hot plate (15 minutes in an oven). The wafer is now ready for application of the desired HD Microsystems polyimide coating. Primed wafers may be stored up to 24 hours before coating with polyimide.

### Storage

**Do not refrigerate.** VM-651 and VM-652 should be stored at room temperature. Keep containers tightly sealed; water will cause the active organosilane to polymerize slowly. The shelf life of VM-652 is six months from date of manufacture when properly stored. The shelf life of VM-651 depends on the exposure of the bottle contents. Unopened bottles may be stored for up to two years. Bottles that show visible precipitate or foreign matter should be properly discarded.

### Availability

VM-651 is available in half-liter fluorinated plastic containers and VM-652 is available in four-liter high-density polyethylene (HDPE) plastic containers from HD Microsystems at the addresses given below.

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***United States*****HD MicroSystems**

250 Cheesequake Road  
Parlin, NJ 08859-1241  
800-346-5656 ext. 13, 14 (Phone)  
732-613-2502 (Fax)

10080 North Wolfe Road, SW3-200  
Cupertino, CA 95014  
800-346-5656 ext. 11 (Phone)  
408-996-0508 (Fax)

***Japan*****HD MicroSystems, Ltd.**

Nikkyohan Building 3F  
4-25 Koraku 1-Chome, Bunkyo-ku  
Tokyo 112-0004, Japan  
81-3-3868-8124 (Phone)  
81-3-3868-8126 (Fax)

**Internet**

[www.hdmicrosystems.com](http://www.hdmicrosystems.com)

***Europe*****HD MicroSystems GmbH**

Hugenottenallee 173-175  
63263 Neu-Isenburg  
Germany  
49-6102-18-1823 (Phone)  
49-6102-18-1824 (Fax)

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**Caution:** Do not use in medical applications involving permanent implantation in the human body.