By increasing the polyvinyl alcohol loading from 0% through 3% of total solids (0%-0.080% of solution), post develop residue can be significantly decreased or eliminated, as shown by scanning electron micrograph of the processed wafer substrate.

EXAMPLE 35

Improved Coat Quality with Hydrolyzed PVA

A further coating composition of the inventions was prepared by admixing the following components in the following amounts based on total composition weight:

0.053 weight % Poly(vinyl alcohol), Variable degree of hydrolysis
0.080 weight % Perfluorobutane sulfonic acid
0.027 weight % Dodecyl benzene sulfonic acid
0.080 weight % Surfynol-104
2.650 weight % Colloidal silica, <20 nm
2.000 weight % 1-Propanol
95.110 weight % Water

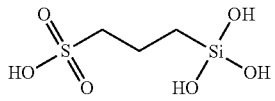
The above solution was spin coated onto an unprimed silicon wafer substrate. It was found by scanning electron micrograph analysis that Increasing the degree of hydrolysis of polyvinyl alcohol improved the applied coating quality, in particular a more uniform coating was provided.

EXAMPLE 36

Preparation of Surface Modified Silica

6 nm colloidal silica stabilized with ammonium hydroxide (pH of 7.3) in a 6.3 weight % solids solution in deionized water was surface modified with various water soluble, reactive silanes.

3-(trihydroxysilyl)-1-propane-sulfonic acid, as shown below, was used as the surface modifier.



Preparation:

100 grams of a 6.3 wt % colloidal silica solution was mixed with 3-(trihydroxysilyl)-1-propane-sulfonic acid in varying ratios. The resulting solutions were then heated to 30° C. for 60 hours. Upon cooling the resulting solutions were mixed with a 5 wt % poly(ethylene oxide) solution, 2000 Mn, in a 1:1 volume ratio to check for compatibility. The solutions were also coated on silicon substrates to check film properties.

Sample	Silica 6.3% solution grams	Silica solids grams	Silane solids grams	Silane wt %	SiOH:Silane molar ratio	Compatibility with PEO	Redispersibility in Water
A	100.00	6.300	3.250	34.0%	1.5	Yes	Yes
B	100.00	6.300	2.600	29.2%	1.9	Yes	Yes
C	100.00	6.300	1.950	23.6%	2.5	Yes	No
D	100.00	6.300	1.300	17.1%	3.7	No	No
E	100.00	6.300	0.650	9.4%	7.5	No	No
F	100.00	6.300	0.325	4.9%	15.0	No	No
G	100.00	6.300	0.163	2.5%	29.9	No	No
H	100.00	6.300	0.000	0.0%	∞	No	No

EXAMPLE 37

Coating Composition Comprising Modified Silica

A further coating composition of the inventions was prepared by admixing the following components in the following amounts based on total composition weight:

0.013 weight % Poly(vinyl alcohol)
0.027 weight % Dodecyl benzene sulfonic acid
0.080 weight % Surfynol-104
2.650 weight % Colloidal silica, Sulfonic acid modified (23 wt % silane)
2.000 weight % 1-Propanol
95.230 weight % Water

The modified silica was prepared as described in Example 36 above. This composition solution was spin coated onto a dried DUV photoresist layer that had been applied to an HMDS primed silicon wafer substrate. The above stack was then imaged on an ASML/300 DUV stepper. Following exposure, the wafers were baked at 110° C./60 sec. and then developed for 45 seconds with 0.26N TMAH developer. The resulting 400 nm 1:1 line/space patterns were then screened under SEM (Scanning Electron Micrograph). Improved resolution of the patterned photoresist image was seen with use of this overcoating composition relative to a comparable processed photoresist that did not include use of the overcoating composition.

EXAMPLE 38

Preparation of Additional Surface Modified Silica

6 nm colloidal silica stabilized with ammonium hydroxide (pH of 7.3) as 6.3% solids solution in deionized water was surface modified with various water soluble, reactive silanes.

Methoxy-poly(ethylene oxide)-tri(methoxy)silane, 525 Mw, as shown below, was used as the surface modifier.

Preparation:

100 grams of a 6.3 wt % colloidal silica solution was mixed with the above silane in various ratios. The resulting solutions were then heated to 40° C. for 60 hours. Upon cooling the resulting solutions were mixed with a 5 wt % poly(ethylene oxide) solution, 2000 Mn, in a 1:1 volume ratio to check for compatibility. The solutions were also coated on silicon substrates to check film properties.