



brewer science

Where innovation takes flight!™

E²Stack® AL412

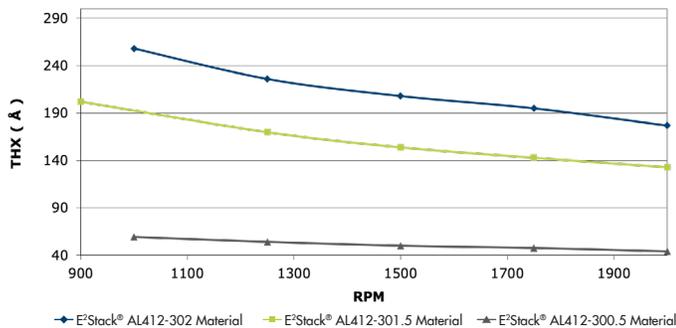
EUV Assist Layer Material

E²Stack® AL412 material has been shown to improve adhesion, process window, pattern collapse, and reduce line edge roughness (LER). This spin-on assist layer material can be applied directly onto inorganic substrates or incorporated into a film stack. It is suitable for use under chemically amplified resists (CARs), metal containing resists, and other non-CAR resists.

BENEFITS

- Reduce LER/LWR
- Reduce pattern collapse
- Promotes adhesion and minimizes collapse effect induced by capillary forces during development
- Meets industry standard outgassing requirements
- Versatile material that can be used on a variety of different resists (CARs, metal-containing resists, and non-CAR resists) and different patterns (contact holes, pillars, and line space)

Spin Speed Curve



MATERIAL PROPERTIES

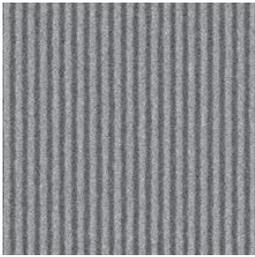
Typical Properties

	248 nm	193 nm	13.5 nm
n	1.45	1.68	~ 1.00
k	0.44	0.11	0.006
Shelf Life at 21°±5°C	12 months		
Ions			
Al, Cu, Mg, Mn, Fe	< 5 ppb		
Ca, K, Na	< 10 ppb		

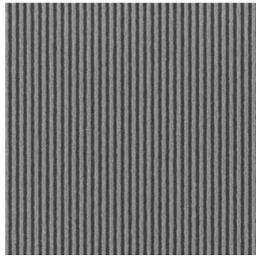
Product-Specific Properties:

Material	Thickness	Spin Speed	Bake
E ² Stack® AL412-301.5	15 nm	1500 rpm	205°C, 60 s
E ² Stack® AL412-302	20 nm	1500 rpm	205°C, 60 s
E ² Stack® AL412-300.5	5 nm	1500 rpm	205°C, 60 s

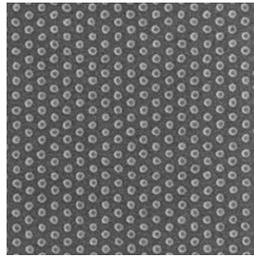
Results from NXE3300



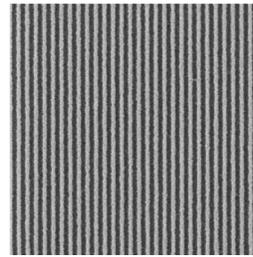
CAR - PTD
13 nm HP



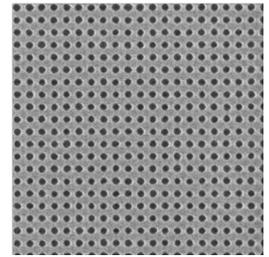
CAR - PTD
16 nm HP



CAR - NTD
H80V46M26



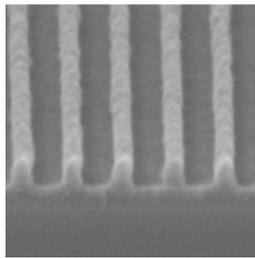
Metal Oxide Resist
12 nm HP



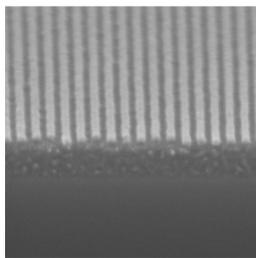
Non-CAR Resist
22 nm HP

Use of an assist layer provides lower roughness than resist on silicon hardmasks or substrates.

SEM Cross Sections of L/S



CAR - PTD
CD=18 nm



Metal Oxide Resist
CD=14 nm

PROCESS RECOMMENDATIONS

Coat

E²Stack[®] AL412 material is applied by a spin-coating process. Apply with dynamic dispense* at 1000 to 3000 rpm and immediately ramp, without spread spin, to 1000 to 3000 rpm for 60 seconds.

*Dispense speed optimization for equipment set is required for thickness uniformity and defect reduction.

Bake

Single-stage hot plate bake at 205° ± 20°C for 60 seconds. Baking temperature optimization may be required to achieve the desired photoresist profile.

Resist Coat

Resist can be applied over the material without any modification to standard resist spin or bake process. An adhesion promoter is not required.

Resist Develop

Use standard photoresist develop parameters.

Exposure

In most applications, exposure dose may need to be optimized from that of a stand-alone resist process.

Dry Etching

E²Stack[®] AL412 material may be dry etched by a number of plasma etching methods in a range of etch gases including O₂, O₂/CHF₃/Ar, C₂F₆, Cl₂, N₂/O₂, O₂/HBr, and HCl.

Stripping

E²Stack[®] AL412 material can be removed by an oxidizing plasma or an oxidizing solvent-stripping process such as ozone plasma strip, Piranha, or RCA cleaning.

© 2022 Brewer Science, Inc.

All statements, technical information, and recommendations contained herein are based on tests we believe to be accurate, but the accuracy or completeness thereof is not guaranteed and the following is made in lieu of warranty expressed or implied. Neither the seller nor the manufacturer shall be liable for any injury, loss, or damage, direct or consequential, arising from the use or inability to use the product. Before using, user shall determine the suitability of the product for his intended use, and user assumes all risk and liability whatsoever in connection therewith. No statement or recommendation contained herein shall have any force or effect unless in an agreement signed by officers of the seller and manufacturer.

Effective Date: 01/20/2022