Anti EBO T14

Technology to prevent epoxy bleed-out

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The common phenomena of resin bleed-out after die attachment and other bonding operations occur when filled adhesive, typically an epoxy, are used as bonding agents. These epoxy resins may bleed-out from the bulk adhesive during the bonding process and contaminate surfaces. They are therefore suspected to have a severe negative impact on wire bonding and molding compound adhesion.

To prevent excessive epoxy bleed-out, Atotech has developed a novel process, which completely eliminates or minimizes this phenomenon.

Anti EBO T14 – Mechanism involved

Anti EBO T14 is a neutral pH post-treatment step, which can be used to eliminate or minimize the bleed on silver, roughened copper and ultrathin Ni/Pd/Au (PPF) surfaces. The mechanism uses surfactants to create a hydrophobic substrate surface, repelling water-containing phases and thus preventing the hydrophilic epoxy resins from bleed-out.

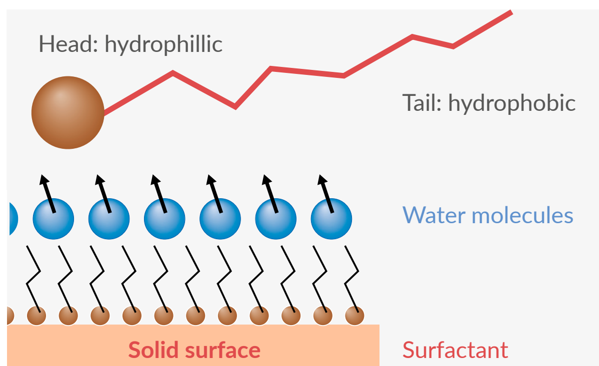

Figure 1: The hydrophobic surfactant pushes the water loving group or phase away, hydrophilic epoxy components are restricted from bleeding-out

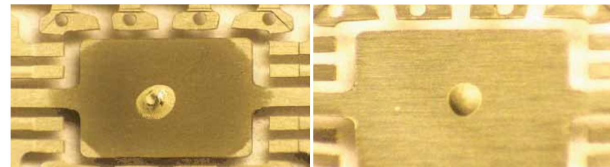

Figure 2: Strong resin bleed-out of an epoxy adhesive on a test pad

Figure 3: No resin bleed-out

Bondability

Anti EBO T14 prevents the transfer of epoxy bleed-out onto leadframe points that require wire bonding, thus ensuring good bond quality.

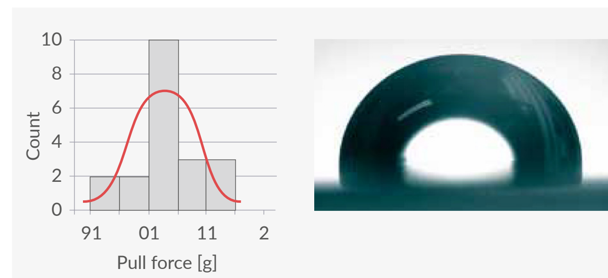

Figure 4: Au wire pull force (25 µm) after Anti EBO T14 treatment (Dage 4000)

Figure 5: Hydrophobic silver surface after treatment with Anti EBO T14, contact angle with water: 85°

Solderability on a Ni/Pd/Au (PPF) surface

Dip and look tests – Both QFN and TSSOP packages treated with Anti EBO T14 pass this solderability test with > 95% solder coverage using Sn/Pb solder at 220 °C ± 3 °C and 5 sec flux dipping.

Wetting balance tests – Both QFN and TSSOP packages pass the versatile quantitative solderability test by fulfilling the required specifications.

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Exemplary EBO test results

Anti EBO T14 on Ag surfaces

Eight epoxy resins have been tested and are in production respectively.

Epoxy	T14, bleed-out (mils)	Result
QMI	0	Passed
8340A	0	Passed
8361J	0 - 1	Passed
84-3J	2 - 3	Passed
8900 NCM	0	Passed
8390	0	Passed
CRM-1076A	0	Passed
84-1LMISR4	0	Passed

Anti EBO T14 shows excellent performance even for the most difficult material – the 84-3J

Anti EBO T14 on Ni/Pd/Au surfaces

Nine epoxy resins have been tested and are in production respectively.

Epoxy	T14, bleed-out (mils)	Result
QMI	0	Passed
AMK	0	Passed
8290	0	Passed
8361	0	Passed
84-1	0	Passed
ST 10	0	Passed
ST 12	0	Passed
SR 4	0	Passed
1076	0	Passed

Anti EBO T14 shows also excellent performance on Ni/Pd/Au for the mainly used epoxy resind

Die shear tests on a Ni/Pd/Au surface

Die shear tests determine the strength of adhesion of the semiconductor die to the die attach pad and are an important test of the functionality of the final leadframe surface.

Chemical Name	Epoxy	Result [kg]	Average	Min	Max
Anti EBO T14	84-3J.	1.6	1.68	1.4	2
		1.4			
		2.0			
		2.0			
		1.4			
Benchmark	84-3J.	1.6	1.60	1.4	1.8
		1.4			
		1.8			
		1.8			
		1.4			

In comparison to the market leading anti bleed-out agent, Anti EBO T14 showed higher strength and better die shear results

Button shear test results

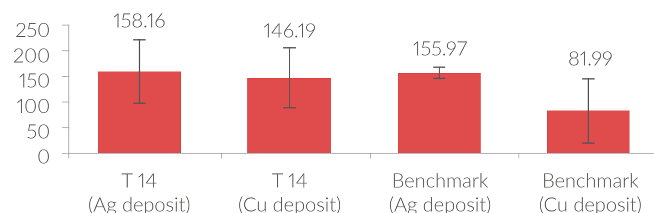

Figure 6: Anti EBO T14 treated samples on Ag and Cu surfaces show very good adhesion compared to benchmarked anti EBO chemistry

Excellent references in automotive industries

Anti EBO T14 today is part of manufacturing processes in the automotive industry. It is qualified and used in power semi-conductors to prevent epoxy bleed-outs whenever solid epoxy molds meet base materials.

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