

TECHNICAL BULLETIN

Alumaguard® Ammonia Testing

Date: June 13, 2001

SUBJECT: Chemical Compatibility of *Alumaguard*® with Ammonia and Ammonium Hydroxide

PRODUCTS TESTED: *Alumaguard* and *Alumaguard White* Tested by 3rd party independent laboratory CAI Laboratory No. 4004

TEST METHODS: Chemical Compatibility with Anhydrous Ammonia (NH₃) Gas
 Chemical Compatibility Ammonium Hydroxide (NH₄OH) Solution

Ammonia, NH₃ is a gas which is very hygroscopic – absorbing and chemically reacting rapidly with water to form ammonium hydroxide, NH₄OH. The water for this reaction can be supplied from humidity in the air. If ammonia is released into the air, it will react with all available moisture in the air to meet the stoichiometric demands of the hydrolysis reaction.

Ammonia is liquefied at a pressure of 125 psia and 20°C. Therefore, at ambient temperature and pressure, ammonia is a gas with a vapor pressure of 8.5 atmospheres.

Ammonia will only be present as ammonia (anhydrous) if there is no water or other chemical reactants available to react with it. The *Alumaguard*® products were tested for their compatibilities with anhydrous ammonia as well as two aqueous solutions of ammonium hydroxide at 5% and 25% concentrations.

These testing environments would be considered as severe based on what would be expected in the field. The products could be considered to be exposed for very short periods in these environments but not for any extended periods of time as this evaluation was conducted.

CONCLUSION:

Both samples performed well in the three environments when tested for compatibility with NH₃ and NH₄OH.

CHEMICAL COMPATIBILITY OF ALUMAGUARD® WITH AMMONIA AND AMMONIA HYDROXIDE				
PRODUCT	ELAPSED TIME (Hours)	20< Gloss* (0-100)	Etching* *	PCT Wt Loss*** (% WT)
Alumaguard	0	62	0.0	0.0
Alumaguard	1	58	Alumaguard	0.1
Alumaguard	2	46	1.0	0.7
Alumaguard	5	35	1.0	2.0
Alumaguard	10	25	1.0	4.2
Alumaguard	20	16	2.0	5.2
Alumaguard	24	12	2.0	5.4
Delta Change		50	2.0	5.4
Average Rate Change per hour		2.08	0.008	0.23

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This information is based on our best knowledge, but POLYGUARD cannot guarantee the results to be obtained.



ANHYDROUS HYDROXIDE, 5% Solution

PRODUCT	ELAPSED TIME (Hours)	20< Gloss* (0-100)	Etching**	PCT Wt Loss*** (% WT)
Alumaguard	0	62	0.0	0.0
Alumaguard	1	56	1.0	0.3
Alumaguard	2	47	1.0	1.2
Alumaguard 60	5	38	2.0	2.6
Alumaguard 60	10	22	2.0	4.8
Alumaguard 60	20	14	3.0	5.7
Alumaguard 60	24	5	3.0	6.9
Delta Change		57.0	3.0	6.9
Average Rate Change per hour		2.38	0.13	0.29

ANHYDROUS HYDROXIDE, 25% Solution

PRODUCT	ELAPSED TIME (Hours)	20< Gloss* (0-100)	Etching**	PCT Wt Loss*** (% WT)
Alumaguard 60	0	65	0.0	0.0
Alumaguard 60	1	55	1.0	0.5
Alumaguard 60	2	45	1.0	1.8
Alumaguard 60	5	33	2.0	3.9
Alumaguard 60	10	20	3.0	7.1
Alumaguard 60	20	15	3.0	7.8
Alumaguard 60	24	4	4.0	8.3
Delta Change		58.0	4.0	8.3
Average Rate Change per hour		2.42	0.17	0.35

* Gloss of surface was measured at a 20° angle. Initial gloss is recorded at 0 hours.

** Etching of the surface film is determined by visual evaluation where 0 is no noticeable etching and 10 is severe etching.

*** Weight loss percentage is the amount of the total sample weight that has been removed by the test environment.