



CALCEAN MINERALS & MATERIALS LLC

Technical Performance Report

Ammonia Reduction Performance – Turf Infill Evaluation

Aragonite Calcium Carbonate vs. Zeolite-Based Infill

Prepared by Calcean Minerals & Materials LLC

Trial Summary

This trial evaluated the ability of aragonite calcium carbonate turf infill to reduce ammonia emissions generated from animal urine on synthetic turf systems. Ammonia is a primary contributor to odor formation on pet turf and athletic surfaces where organic waste accumulates. The study compared aragonite turf infill performance against a zeolite-based odor-control infill and a turf-only control.

Objective

Evaluate the effectiveness of aragonite calcium carbonate turf infill for reducing ammonia emissions and odor formation on synthetic turf surfaces.

Methods

Synthetic turf sections were prepared with infill materials and 20 mL of coyote urine was applied to a 4 in × 4 in area to simulate a canine urine deposition pattern. Each infill material was applied at a rate of 2 lb per cubic foot and compared to a turf-only control.

Ammonia concentrations were measured using a Forensics Detectors Model NH3000 ammonia meter with a measurement range of 0–1000 ppm. Measurements were recorded at two locations: turf surface level and 9 inches above the turf surface. Readings were collected at timed intervals over a 24-hour period.

Key Results

Results demonstrated that aragonite turf infill significantly reduced ammonia concentrations compared to both untreated turf and the zeolite-based odor control material evaluated in this study.

The finer particle size aragonite (20 × 45 mesh) exhibited the fastest ammonia reduction, likely due to increased mineral surface area and greater interaction with the urine solution.

After one hour, ammonia levels measured 9 inches above the turf decreased by 71% with aragonite, compared to a 10% reduction with zeolite relative to the control (Figure 2). At turf level, ammonia concentrations decreased by 58% with aragonite and 28% with zeolite (Figure 1).

Across all materials tested, ammonia concentrations approached near-zero levels within 24 hours. However, aragonite reached 0 ppm at the 9-inch measurement level within 5 hours, while zeolite required more than 7 hours to achieve the same result.

At the 7-hour mark, ammonia levels measured at turf level were 87.5% lower with aragonite compared to zeolite.

Conclusion

Aragonite calcium carbonate demonstrated strong performance as a turf infill material for reducing ammonia-related odors on synthetic turf systems. Results indicate that aragonite infill reduces ammonia concentrations more rapidly than zeolite-based infill materials, with finer particle grades providing the most rapid odor reduction.

Supplemental Data

Supplemental data tables may include bulk density measurements, particle size distribution (Rotap analysis), ammonia concentration measurements at turf and airspace levels, and percent ammonia reduction calculations over time.

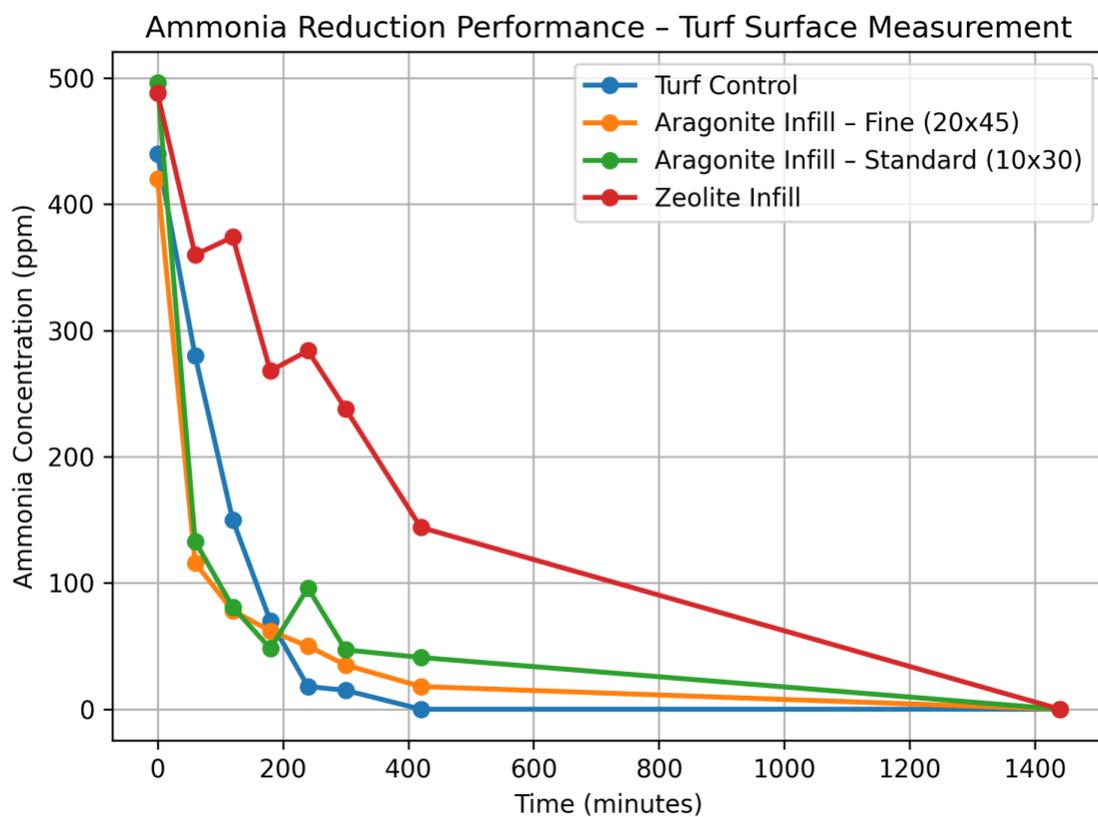


Figure 1: Ammonia reduction performance measured at the synthetic turf surface.

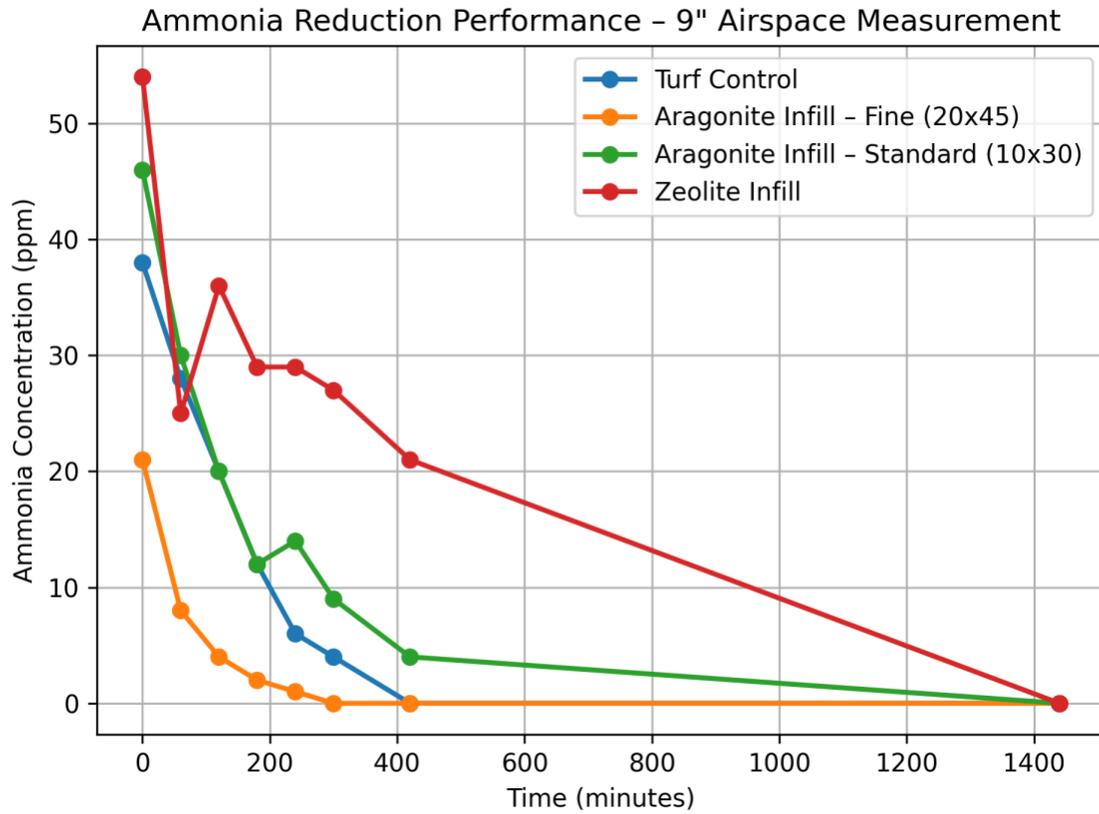


Figure 2: Ammonia reduction performance measured 9in above turf surface.

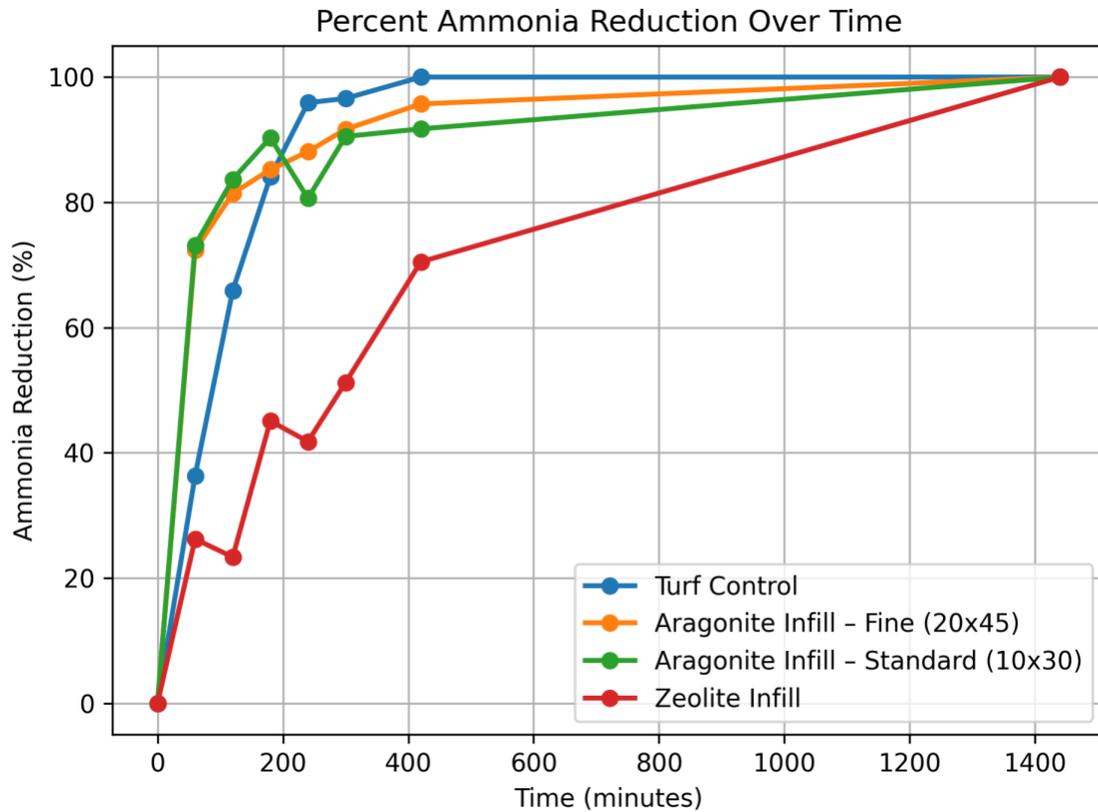


Figure 3: Percent ammonia reduction over time relative to initial concentration at the turf surface

Infill	Rotap Analysis (% Retained)					
	10	20	30	40	50	Pan
Aragonite 10 x 30	0	40.37	52.07	7.04	0.0014	0.0038
Aragonite 20 x 45	0	0.0017	2.24	38.96	58.17	0.0046
Zeolite	0.41	44.96	27.32	19.94	5.05	2.35

Table 1: Particle size distribution measured via Rotap Analysis

Bulk Density		
Infill Sample	Loose g/cm³	Packed g/cm³
Aragonite 10 x 30	1.195	1.328
Aragonite 20 x 45	1.572	1.709
Zeolite	0.7304	0.83

Table 2: Bulk density of each respective treatment group

9" Level ppm				
Time (minutes)	Base No Infill	Aragonite 20 x 45	Aragonite 10 x 30	Zeolite
0	38	21	46	54
60	28	8	30	25
120	20	4	20	36
180	12	2	12	29
240	6	1	14	29
300	4	0	9	27
420	0	0	4	21
1440	0	0	0	0

Table 3: Raw data of ammonia readings at 9" airspace measurements

Turf Level ppm				
Time (minutes)	Base No Infill	Aragonite 20 x 45	Aragonite 10 x 30	Zeolite
0	440	420	496	488
60	280	116	133	360
120	150	78	81	374
180	70	62	48	268
240	18	50	96	284
300	15	35	47	238
420	0	18	41	144
1440	0	0	0	0

Table 4: Raw data of ammonia readings at turf level