13th July 2021

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Dear Nick,

AMENDMENT ANALYSIS

Brief

As requested, AGCSATech further investigated the potential for Mineral Magic as a sportsturf amendment.

Laboratory testing was carried out to determine differences in hardness/strength between the USGA sand and the two Mineral Magic samples. Using a modified method for fine aggregate from AS 1141.11 – 1997 Table 1, attempt was made to create a method that demonstrates this.

As this test method has not had enough validation and precision testing, below is a summary of the raw data, observations and parameters used:

Physical Strength

Summary

- Two samples of each material were washed and dry sieved, retaining the most representative particle sizes.
- The particle sizes used had 100% retained on the 0.250mm sieve prior to crushing.
- A compression machine with a digital load cell is used to apply a force 20+5kN for five minutes for a total of 100kN applied force.
- The sample was removed from the canister and re-sieved to calculate the average percentage of material now passing.

Sample	Size of fraction used	After crushing sieve size	% Material Crushed
USGA Sand	0.500 – 0.250mm	0.250mm	7.0
Mineral Magic – Fine	2.0 – 0.500mm	0.250mm	14.5
Mineral Magic – Medium	4.0 – 1.0mm	0.250mm	6.8*

***Note:** The particle sizes and bulk densities used varied with each sample, the mineral magic-fine sample was most like the USGA sand tested. Based on this limited data, the mineral magic-fine crushed twice as much as the USGA sand under the same conditions. The mineral magic-medium sample contains larger particle sizes, large air voids and less particles compacted in the test cylinder. This suggests the mineral magic-medium is too dissimilar to the USGA sand for comparable results.

Chemical Strength

The mineral magic-fine and mineral magic-medium were both tested to observe common chemical reactions, with the following observations made;

Summary

- No reaction to Acid (36% HCL)
- No reaction to strong Base (Sodium Hydroxide)
- Emerson class number 8, no slaking or swelling
- Neither flocculates or disperses

Hydraulic Conductivity
The hydraulic conductivity of the USGA sand was tested against a blend with 5% powdered Mineral magic (w/w by mass, retained on 0.053mm sieve) to simulate worst case if it all broke down.

Sample	Hydraulic Conductivity @ 32 drops (mm/hr)
USGA Sand	1128
USGA + 5% Powdered Mineral Magic	565

The drainage rate dropped by 50%, but doubtful it would drop below 150mm/hr. even with 10% amendments.

Comments

After initial testing, the results suggest that under laboratory conditions, the amendment performs well. With all new products, a research trial would be needed to determine the viability of the product as an amendment for use in sportsturf. As with all soil amendments, we recommend thorough testing of samples with and without the inclusion of amendments to ensure they meet specification requirements.

If you have any queries, please do not hesitate to contact me.

Yours sincerely

Tim Fankhauser
AGCSATech

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