Shrinkage Behavior of An N-Methylacrylamide Grouted Sand

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Abstract

In this study chemically grouted sand was tested under different temperature and relative humidity conditions. Tests where performed at room temperature and 40°C and a relative humidity of 50% and 90% respectively. The specimens where monitored regularly to determine the change in weight and volume of the specimen. The tests were continued until there was no significant change in the weight and volume of the specimens.

1. Introduction

Chemical grouts are being used for reducing leaks in a number of Civil Infrastructure facilities; hence, it is essential to quantify the changes in the grouted sand due to service conditions, such as a wet/dry cycle, shrinkage under different temperature and relative humidity conditions and completely wet conditions (water absorption). Polyacrylamide is being used in many fields such as municipal water treatment, sewage treatment, reverse osmosis membranes, mineral processing, drag reducing, oil recovery, paper manufacture and soil conditioning.

2. Objective

To investigate the shrinkage behavior of N-methylacrylamide (AV-118) grouted sand under different temperature and relative humidity conditions.

3. Results and Discussions

The shrinkage property of grouted sands (N-methylacrylamide grout-AV-118 grout) was investigated and it was found that the relative humidity had a considerable effect on the shrinkage property of the grouted sands. The volume shrinkage of AV-118 grouted sand specimens was attributed to the loss of water from the specimen. The percentage loss in volume was about 0.4% at 23°C and 50% relative humidity and 0.02% in case of 40°C and 90% relative humidity. Under these testing conditions the weight change varied from –0.6% to-17%.

4 Conclusions

1. Relative humidity was found to be a key-controlling factor in shrinkage measurements. This was supported by less shrinkage observed in case of 90% relative humidity condition when compared to 50% relative humidity condition for the same temperature condition.
2. The volume shrinkage was the lowest in the case of 23°C and 90% relative humidity condition. The volume shrinkage was about 0.02%

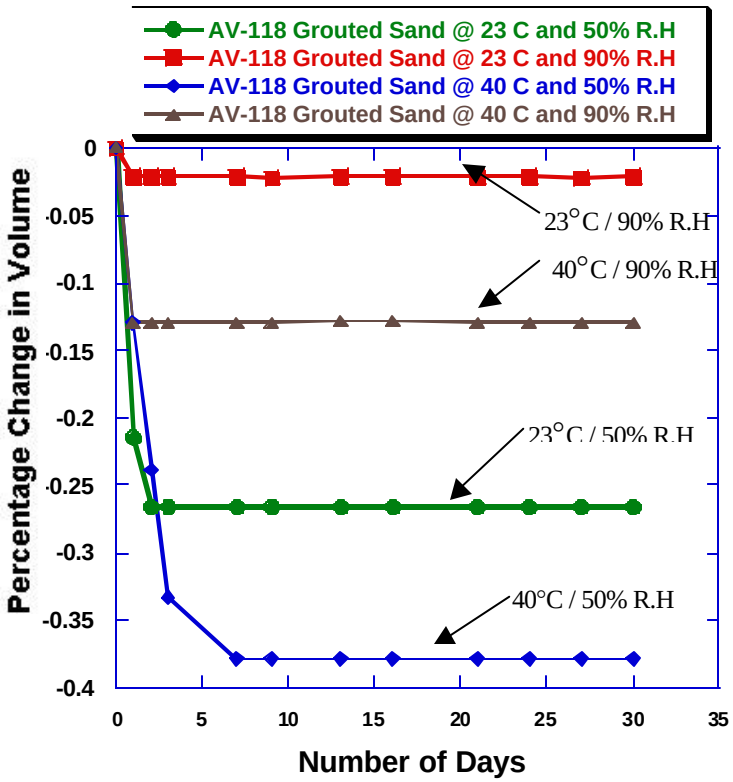

Figure 1. Shrinkage of AV-118 grouted sand under different temperature and relative humidity condition.

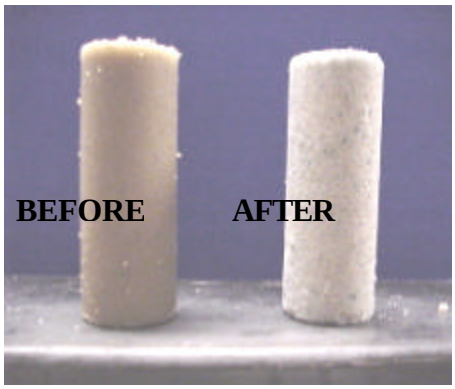

Figure 2. AV-118 grouted sand before and after shrinkage @ 23°C and 50% relative humidity.

5. Acknowledgment

This work was supported by the Center for Innovative Grouting Materials and Technology (CIGMAT) under grants from various industries.

6. References

1. Lee, W. F, Yeh, P. L., "Thermoreversible hydrogels II effect of some factors on the swelling behaviour of N,N-dimethylacrylamide and n-butoxymetyl acrylamide copolymeric gels", *Journal of Applied Polymer Science*, Vol. 65, 909-916, John Wiley & Sons, Inc. (1997).
2. Rudzinski, W. E., Dave, A. M., Vaishnav, U.H., Kumbhar, S. G., Kulkarni, A.R., and Aminabhavi, T.M. "Hydrogel as controlled release device in agriculture", *Designed Monomers and Polymers*, Vol.5, No.1, 39-65 (2002).

STANDARDS

1. CIGMAT Standard GR-2 (Standards for measuring the compressive strength and Stress- Strain relationship of grout and grouted sand)
2. CIGMAT Standard GR-3 (Standard Test Method for Wet and Dry Cycle Resistance of Grouts and Grouted Soils).

ASTM E104-85 (1996) "Standard Practice for Maintaining Constant Relative Humidity by Means of Aqueous Solutions," Volume: 11.03, Subcommittee: D22.11 **West Conshohocken, PA.**