Piezoresistivity and Stress-strain Behavior of Acrylamide Grouted Sand

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Abstract
In this study, stress-strain and piezoresistivity behavior of grouted sand at room temperature were investigated. Several sands were grouted using acrylamide chemical grout and tested with 0% and 0.5% conductive filler. The highest grouted sand densities for fine sand was 2.07 gr/cm^3 and for Ottawa sand was 2.05 gr/cm^{3}The strength of grouted sand increased when particle size decreased. The piezoresistivity decreased with conductive filler.

1. Introduction

Acrylamide (C_3H_5NO), is a monomer that is used as an aqueous solution in the grouting applications. Catalysts, activators, accelerators and inhibitors are mixed together to obtain grout solution. Since soil is a construction material and easy to access, it can be used for constructing dams, roads, embankments and house. There are many attempts to improve strength properties of soil. In this study, stress-strain and piezoresistivity behavior of grouted sand at room temperature were investigated.

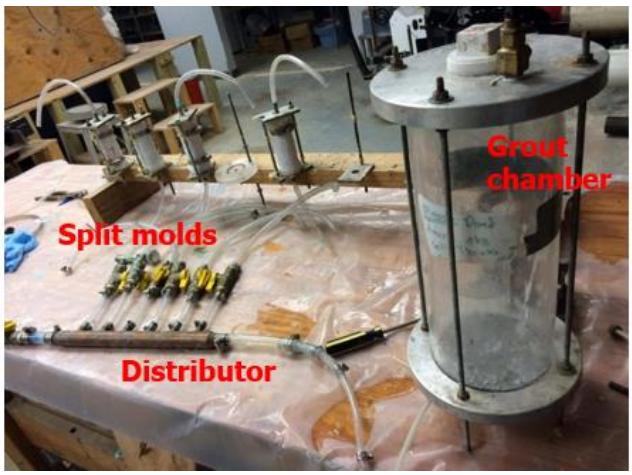
2. Objective

The overall objective was to investigate the stress-strain and piezoresistivity behavior of grouted sand with conductive filler and without it.

3. Materials and Methods

In this study, The grout used for this study were acrylamide grouts, commercially named AV-100 and LCR devise used to measure resistance of grouted sand.AV-100 Chemical Grout is a mixture of three or more water-soluble chemicals that produce stiff gels from properly catalyzed solutions. Two different type of sand was used with 0% and 0.5% Conductive Filler. One was fine sand named as sand1 with 0%CF and named sand2 with 0.5% CF, another was Ottawa sand named as sand3 with 0%CF and named sand4 with 0.5% CF.

All the grouted sand samples that were tested under unconfined compression were prepared in cylindrical Teflon molds 3.8 cm (1.5 in.) in diameter and 10.2 cm (4 in.) in length. Teflon filters were used at the top and bottom of the molds to keep the sand in place. The grouting apparatus for making samples in the laboratory is schematically shown in Figure 1. It consists of an enclosed grout chamber, cylinder Teflon molds and a hydraulic system for injecting the grout from the chamber into the molds.



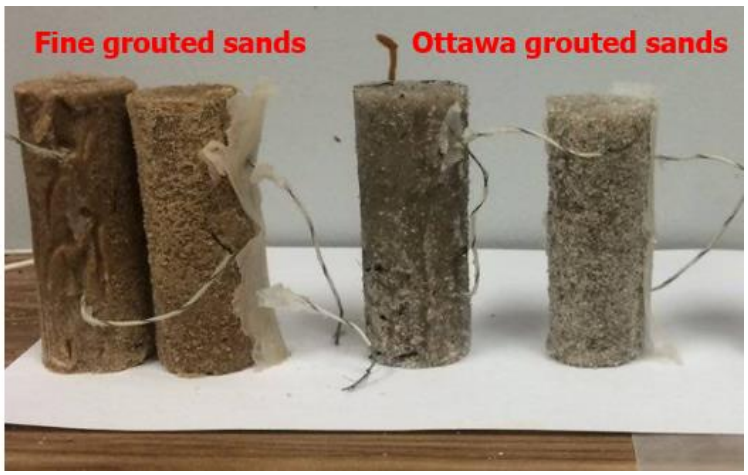


Fig 1. Schematic grouting apparatus and samples

4. Results and Analyses

The effect of sand type on the stress-strain relationship of grouted sand is shown in Figure 2. Type of sand affected the strength and shape of the stress-strain relationship of grouted sands. The compressive strength of grouted sands increased with the decrease in particle size of the sand. Also, addition of 0.5%CF increased nonlinear behavior in Figure 2. Moreover, Increasing CF decreased piezoresistivity of grouted sand. With 0.5% of CF decreased around 22% piezoresistivity of grouted sand. So, it is concluded that using CF increases the sensitivity of material.

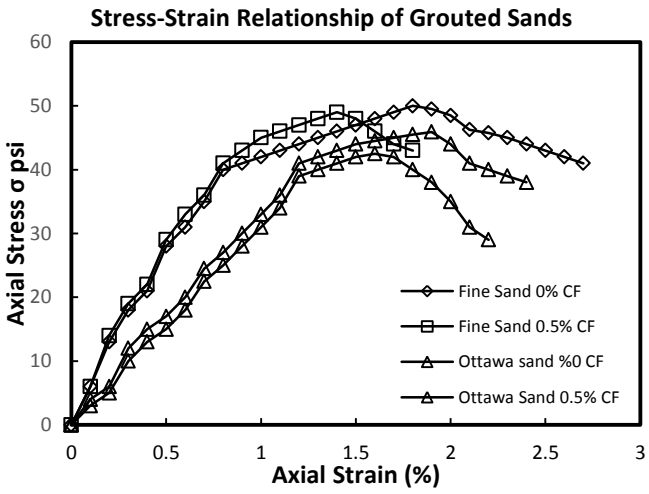


Fig 2. Stress-strain behavior of grouted sand

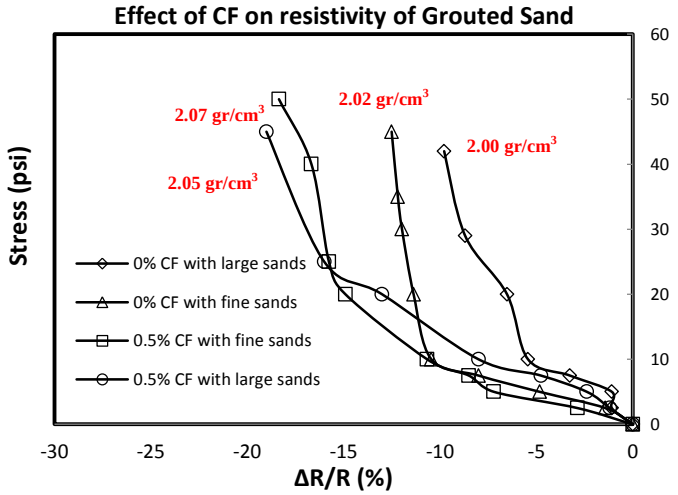


Fig 3. Piezoresistivity behavior of grouted sand

5. Conclusion

Based on this study following could be concluded:

(a) Strength of fine sand was higher than Ottawa sand.
(b) Adding CF increased nonlinear behavior of grouted sand.
(c) With 0.5% of CF decreased around 20% piezoresistivity of grouted sand. So, it is concluded that using CF increases the sensitivity of material.

6. Acknowledgements

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7. References:

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