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Editorial

Geomaterials in Geotechnical Engineering

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In the special issue, a total of 79 manuscripts were received, and 44 of these were accepted. This special issue aims to highlight some recent innovations on multiphase geomaterials before and after modifications. Geomaterials are materials inspired by geological systems originating from the billion years long history of the earth. However, with the industrialization, these materials are artificially processed to the outputs as construction materials or by-product wastes. The geomaterials may include rock, clay, granular materials, treated soils, and industrial waste. The cognition on the observed behaviour of geomaterials should be upgraded by newly developed multiphase/scale analysis methods. It could be of great benefit to enhance the safety and reliability of geotechnical infrastructures built on/by geomaterials if a clear understanding can be achieved. Therefore, the micro-macro behaviour, interpretation and modelling, modification, and engineering application of multiphase geomaterials should be systematically studied by the new testing technologies, new theoretical frameworks, and new analysis tools. In particular, as environmental requirement and engineering availability of by-product wastes, the efficient recycling of the waste for geotechnical infrastructures is included in this issue.

1. Natural Geomaterials

This special issue successfully attracted several interesting original articles addressing the mechanical and hydraulic behaviour of natural geomaterials.

Special attentions have been paid to the mechanical and hydraulic behaviour of natural geomaterials under complex loading conditions like drying-wetting cycles and loading cycles. For example, C. Zhang et al. presented a series of laboratory and centrifuge model tests on influence of swelling rock with drying-wetting cycles on stability of canal slope. L. Zeng et al. studied the effect of colluvial soil slope fracture's anisotropy characteristics on the rainwater infiltration process. Y. Zhou et al. focused on the deformation and damping characteristics of lightweight clay-EPS soil under cyclic loading. Y. Li et al. presented a new method to perform a calculation of capillary rise height of soils by the SWCC model. J. Zhang et al. studied influences of drying and wetting cycles and compaction degree on strength of Yudong silt for subgrade.

One of the highlights is the engineering behaviour of mixed natural geomaterials like soil-rock mixtures. For example, F. Zhu et al. provided a study on formation mechanism and mechanical properties of soil-rock mixture containing macropores. B. Zeng et al. presented a study on compaction characteristics and construction control of mixtures of red clay and gravel. M. Ren et al. proposed a systematic method to evaluate the shear properties of soil-rock mixture considering the rock size effect.

In the scope of study on the natural geomaterials, another focus is creep behaviour. B. Zhao et al., for example, presented experimental and theoretical studies on the creep behaviour of Bayer red mud. Q.-Y. Zhu and P. Qi presented numerical modelling of thermal-dependent creep behaviour of soft clays under the one-dimensional condition.

Microstructure and its variation in the natural geomaterials such as particle breakage and anisotropy are also highlighted in this issue. For example, X. Li et al. presented a numerical study of the dynamic compaction process

considering the phenomenon of particle breakage. J. Zhang and B. Zhang investigated the fractal pattern of particle crushing of granular geomaterials during one-dimensional compression. K. Zhang et al. presented a microstudy of the anisotropy of the sandy material.

2. Treated Geomaterials

Compared with the natural geomaterials, this special issue gathered more innovative studies on the mechanical and hydraulic behaviour of treated geomaterials.

The strength and deformation behaviour of the treated geomaterials are essential for their engineering applications. Therefore, many research works in this special issue are related to the experimental study on the strength and deformation behaviour. For example, P. Jiang et al. studied the shearing performance of lime-reinforced iron tailing powder based on energy dissipation. R. Gui et al. presented an experimental study on the fine-grained uranium tailings reinforced by MICP. J. Ding et al. performed a series of consolidated undrained triaxial compression tests and proposed a strength criterion of solidified dredged materials. Q. Ma et al. employed triaxial tests to study the shear performance of flax fiber-reinforced clay.

Regarding the research related to the treated geomaterials, the environmental effects of treated geomaterials are also one of the focuses. For example, P. Yang et al. studied the effect of osmotic pressure on migration behaviour of *n*ZnO in GCLs. M. Ammar and W. Oueslati presented a study on the crystalline swelling process of Mg-exchanged montmorillonite. J. Wei et al. studied the effect on the resistance of concrete acid corrosion in superficial soil layers. Y. Zhang et al. presented a mechanical and environmental risk evaluation for the utilization of electroplating sludge as subgrade backfill materials. F. Zha et al. investigated engineering properties of solidified/stabilized Pb-contaminated soil based on alkaline residue. Y.-G. Chen et al. provided a study on thermal conductivity of compacted GO-GMZ bentonite used as a buffer material for a high-level radioactive waste repository. Z. Cao et al. presented an experimental study on electrical resistivity of cement-stabilized lead-contaminated soils.

Some attentions are also on reinforcement approaches. For example, J. Hu et al. presented innovative reinforcement approaches for organic sandy soil. T. Xia et al demonstrated a study on ceramsite production using dredging sea mud and its biofilm formation capacity evaluation. C. Yu et al. discussed the stabilization of oil-contaminated Wenzhou clay by cement.

Regarding the hydraulic properties of treated materials, H. Ye et al. presented experimental studies on drying-wetting cycle characteristics of expansive soils improved by industrial wastes. Some interesting research works related to the microstructure of treated geomaterials are included. For example, T. P. Mashifana et al. studied geotechnical properties and microstructure of lime-fly ash-phosphogypsum-stabilized soil.

Therefore, in our opinion, this special issue brings new insights into the natural and treated multiphase geomaterials, in terms of the theoretical studies from micro- to macroscale and experimental investigations in laboratory and in situ. We hope that the information delivered in this special issue will help to pave the way for the understanding and development of multiphase geomaterials and their engineering applications.

Conflicts of Interest

The editors declare that they have no conflicts of interest regarding the publication of this special issue.

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