International Conference on
Emergency & Personalized Medicine
December 05-06, 2022 | Dubai, UAE

International Journal of
Materials Research
ISSN: 2324-8602X

ISSN: 2324-8602
International Journal of Cardiovascular Research

Volume 10X
Issue 4 X

# Introduction to a Few New Sand-based Materials and Their Applications: Breathable Sand, Sand-based Pervious Pavers, and Sand-based Building Materials

**Yuming Su[1], Shengyi Qin[2], Chandra Dake[3]**

[1] State Key Laboratory of Silica Sand Resources Utilization (US Office), College Park, MD 20742, USA
[2] Beijing Rechsand Science & Technology Group Co., Ltd., Beijing 100083, China
[3] Dake Rechsand LLC, Dubai P.O. Box 82071, United Arab Emirates

## Abstract:

Innovative material studies have been conducted over the past a couple of decades in the State Key Laboratory of Silica Sand Resources Utilization in China, to modify and treat aeolian sands into engineered sands. The approach, in general, is to use sands as the core materials and different nano-coatings are applied to meet the desired engineering material property needs. A series of sand-related products were invented and they have been widely used in many industry sectors, such as 1) foundry, 2) stormwater infiltration, storage and treatment, 3) agriculture, 4) building, and 5) oil and gas production. Three popular sand–related products and their associated applications are introduced in this paper:

1) Air-permeable Watertight Sand (hereinafter “Breathable Sand”): Multiple coating and surface modification processes are applied to aeolian sand particles, and thus the air permeability of the loose sands can be retained, while the material is watertight due to its good water repellency. Due to these unique features, Breathable Sand has been used as a in various agricultural applications in arid and semi-arid areas. About 30%-80% water saving can be achieved with a thin layer of Breathable Sand applied below the crop’s growth zone. The roots were stronger and the average leaf count, grain weight, grain per ear, matured grain count, and grain maturity rates were also higher. Case studies in China and in UAE are introduced.



Figure 1 Breathable Sand Materials and Agriculture Applications

2) Sand-based Pervious Brick: thanks to the special hydrophilic coatings and non-sintering brick formation, the finished brick materials are pervious, with micro pores and full surface infiltration features. They have been wildly used in many stormwaters management projects in the Sponge City construction. Case studies in China are introduced.



Figure 2 Sand-based Pervious Brick Materials and Sponge City Construction Applications

3) Sand-based Building Material: besides paving bricks, a few sand-based building materials were also invented. These include sand-based blocks, sand-reinforced plastic boards, flexible sand-based wall panels. Sand-based materials demonstrate good structural properties, while also are excellent in sound-proofing and fire-resistance rating. Building projects in China are introduced.



Figure 3 Sand-based Building Materials and Their Applications

## About Research Institute:

State Key Laboratory of Silica Sand Resources Utilization is the national key laboratory in China specialized in silica sand material researches and sand utilization. It is one of the first batch of the 36 state key laboratories supported by enterprises (and one of the two which is supported by private enterprises). With five offices in China and one in the USA, the laboratory has a silica sand resource utilization database department, a microstructure lab, a material structure testing lab, a stormwater pollution control lab, a water quality analysis lab, a soil analysis lab, a proppant testing lab, an oil and gas production lab, and a casting material research lab.

## About Research Topic:

Desertification is caused by a variety of factors, including climate change and overexploitation as a result of human activities, such as improper land management and deforestation. Aeolian sands are common materials from deserts, but they are usually poorly graded, inactive, and low in material strength. Thus, they are not appropriate to be directly utilized in most construction and engineering applications. They have been considered as wastes rather than resources in most of the time. With an international shortage on regular construction sand materials, more researches are needed on aeolian sand utilizations.

## Biography

Dr. Su has more than 20 years of work and research experience in water resources engineering, specializing in stormwater management. Dr. Su is actively involved in "Sponge City" Initiative in China, by promoting international collaboration and sustainable stormwater management concepts and technologies in China. His recent projects include designs of flood controls, green infrastructure, sand-based pervious materials, and stormwater harvesting and reuse, as well as stormwater policy studies. Dr. Su is the vice director of State Key Laboratory of Silica Sand Resources Utilization. He was a Senior Project Water Resources Engineer with Golder associates. He is a Diplomate of Water Resources Engineer by American Academy of Water Resources Engineers (AAWRE), and a Founding Member.



Mr. Qin, Shengyi is an expert in the area of silica sand resources utilization. He is the Chairman of Beijing Rechsand Science and Technology Group Co., Ltd., Director of the State Key Laboratory of Silica Sand Resources Utilization, Vice Director of China Dessert Management and Sand Industry Association. Mr. Qin has devoted himself on silica sand utilization and reverse desertification for more than 30 years, and implemented more than 100 national research projects. Mr. Qin holds 162 patents (31 international patents), participated in 41 technical standard preparation. He is the inventor of many innovative sand materials and products.



Mr. Chandra Dake is the Executive Chairperson and founding member of the Dake Group - a community empowerment driven environmentally friendly, technology focused organization. Mr. Dake has a strong philanthropic spirit with a solid focus on community development and upliftment. He has 22 years' of experience in conceptualizing socially sustainable business models and has made him a leader in the area of economic social development.



**References:**


Su, Y.; Qin, S.; Dake, C. (2022). Salt-Affected Soil Management Utilizing an Innovative Coated Sand Material—"Breathable Sand". Environ. Sci. Proc. 2022, 16(1): 49.

Su, Y.; Qin, S; Dake, C. (2021). "Salt-affected soil management utilizing coated sand materials - Breathable Sand". FAO. 2022. Halt soil salinization, boost soil productivity – Proceedings of the Global Symposium on Salt-affected Soils. Rome. 20–22 October 2021.

Dake, C.; Qin, S.; and Su, Y. (2021). "Enhancing Rainwater Harvesting Through Pervious Pavement System Based on Surface Free Energy." In Proceedings of the 4th International Conference on Civil Engineering and Urban Planning (CEU 2021), Dubai, UAE, 2021 August.

Qin, S.; Long, Y.; and Su, Y. (2020). "Preparation of Water-based Epoxy Resins and Applications on Sand-based Permeable Materials." Thermosetting Resin. 2020,35(3):1-5

Su, Y. et al. (2020). "Establishment of Long-term O&M Program and Sustainable Funding Stream for China Sponge City Initiative." In Proceedings of International Low Impact Development Conference. Bethesda, Maryland. 2020.

Rechsand's Breathable Sand Materials in Agricultural Applications. Available online: https://www.rechsand.com/index.php/Pr_index_gci_40.html (accessed on 1 August 2022). (In Chinese)

Dake Rechsand. Available online: http://www.dakerechsand.com/ (accessed on 1 August 2022).

UAE National News dated July 30, 2021. What is Rechsand? How breathable sand could revolutionise farming in the UAE. Available online: https://www.thenationalnews.com/lifestyle/home/2021/07/30/what-is-rechsand-how-breathable-sand-could-revolutionise-farming-in-the-uae/ (accessed on 1 August 2022).