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Title:

Water retentive pavement system using hydrophobic sand

Authors & affiliations:

Yumi Wakita[*1], *Osamu Yamada*[1], *Akira Taomoto*[1], *Stephen John*[1], *Sachio Nagamitsu*[1], *Norihisa Mino*[1], *Akira Kondo*[2]
[1]*ATRL,Panasonic Corp.* [2]*Osaka University*
Wakita.yumi@jp.panasonic.com

Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

For mitigating the heat island phenomenon, some water retentive pavement systems have been proposed. These systems store water underneath paving blocks, which can be absorbed and evaporated by the block's capillary mechanism, cooling the surface; however, control of the retained water quantity is necessary. One problem of current systems is that excess water conditions are uncontrolled, overflowing after severe rain fall and leading to dangerous pooled surface water. For large areas, it is preferable that the water level can be controlled simply and at low cost.

We have developed a hydrophobic sand using a chemical absorption monolayer method. The hydrophobic sand resists the capillary flow of water, forming a barrier with a distinct water entry pressure. Below this pressure, water can be retained by a hydrophobic sand layer; however, above this pressure, water enters the hydrophobic sand layer and drains away. The entry pressure can be controlled by the sand particle size (Fig.1) or by the addition of uncoated sand.

In this paper, we propose a new, simple water retentive pavement structure using a hydrophobic sand layer below ordinary paving blocks (Fig.2). As a step towards a system with full overflow control, we have experimentally confirmed our system's ability to retain water and cool the pavement surface during summer, as compared with to a system using only standard paving blocks and another system using specialized water-retaining paving blocks. The day after rainfall of 23mm, the surface temperature was almost equal to the air temperature and 10°C cooler than the comparative systems (Fig.3(a)), indicating that rainwater was retained. Due to the wet surface, the reflective insolation of the hydrophobic sand system decreased 24-46% compared to the other systems (Fig.3(b)). These results show our proposed system can effectively store and evaporate water, reducing the heat island effect and increasing human comfort.

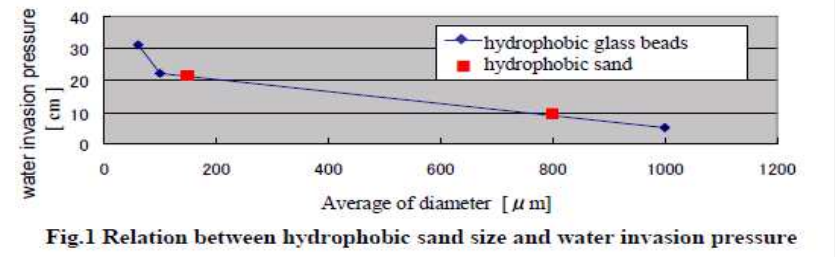

Fig.1 Relation between hydrophobic sand size and water invasion pressure

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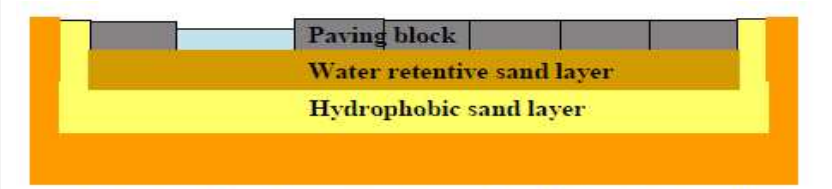

Fig.2 Structure of cooling pavement using hydrophobic sand

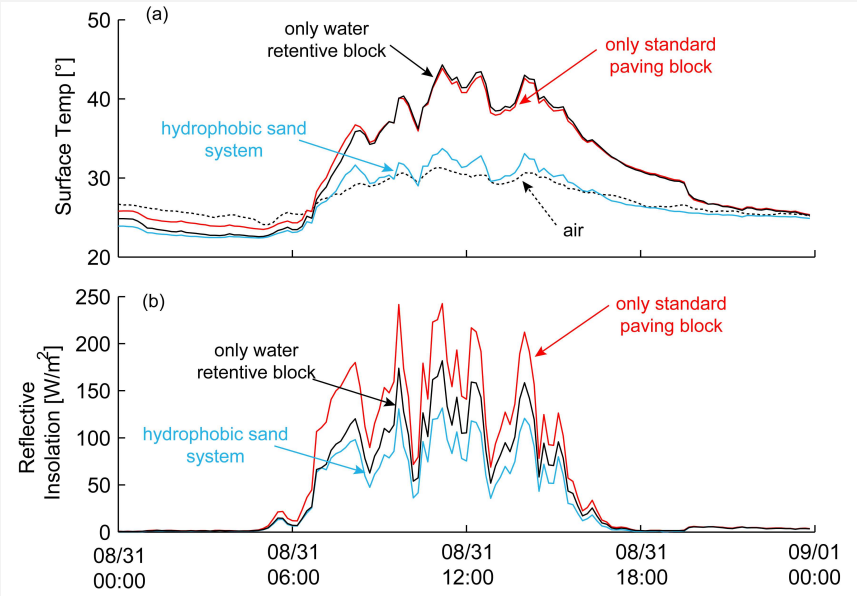

Fig 3: (a) Surface temperature one day after rain for hydrophobic sand system, system using only standard paving blocks and special water retentive blocks and (b) reflective isolation for the same systems.