



SEASHELL POROUS PAVEMENT SUSTAINABLE ROAD CONSTRUCTION

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Patent: No. 202301018 (2023)

Objective:
To produce high-quality of the porous asphalt incorporating seashell
To study the image processing of porous asphalt containing seashell

Product Background:
Porous asphalt pavement is a type of pavement that allows water to pass through it. It is made of aggregate and binder, with a high percentage of voids. The use of seashell as a partial replacement of aggregate can reduce the environmental impact and improve the drainage system.

Novelty/Originality/Inventiveness:
This research is a novel and original work. It is the first time that seashell is used as a partial replacement of aggregate in porous asphalt pavement. The research also includes the use of image processing to analyze the porous asphalt containing seashell.

Environmental Impact:
The use of seashell as a partial replacement of aggregate can reduce the environmental impact of the pavement. It can reduce the amount of aggregate used, which in turn reduces the carbon footprint of the pavement. It can also improve the drainage system, which can reduce the risk of flooding and water pollution.

Methods:
The research was conducted using a laboratory experiment. The porous asphalt containing seashell was prepared using a hot mix asphalt method. The image processing was done using a software called ImageJ. The results of the image processing were compared with the results of the laboratory experiment.

Marketability & Commercialisation:
The porous asphalt containing seashell has a high potential for marketability and commercialisation. It can be used in various applications, such as roads, parking lots, and drainage systems. It can also be used in urban areas to reduce the risk of flooding and water pollution.

Product Image and Product Characteristics-Results:
The porous asphalt containing seashell has a high porosity and permeability. It can absorb water and allow it to pass through it. The results of the image processing show that the porous asphalt containing seashell has a high percentage of voids and a high permeability.

Conclusion:
The porous asphalt containing seashell is a sustainable and high-quality pavement. It can be used in various applications and has a high potential for marketability and commercialisation.

Achievement/Award:
Gold Medal CITREX 2024

Male exhibitor wearing a green shirt and grey trousers, standing on the left side of the booth. He is wearing a blue surgical mask and has his hands clasped in front of him. He is wearing a blue lanyard with an ITEX 2024 badge.

Female exhibitor wearing a black suit, standing on the right side of the booth. She is wearing a grey surgical mask and has her hands clasped in front of her. She is wearing a blue lanyard with an ITEX 2024 badge.

Exhibition table covered with a blue cloth, featuring a laptop displaying the project website, brochures, and samples of porous pavement. The table is set up in the center of the booth.

[Research](#)

Natural replacement seashells in porous asphalt mixture for parking lot pavement

18 January 2022

PAYA BESAR, 12 January 2022 - Water is a major factor contributing to road pavement damage, especially in parking lots.

Water will diffuse and produce moisture and cause a saturated aggregate layer.

Therefore, to overcome this problem, a study titled Seashell Porous Asphalt - Sustainable Road Construction by a researcher and lecturer of the College of Engineering (KKEJ), Universiti Malaysia Pahang (UMP), Associate Professor Dr. Ramadhansyah Putra Jaya, 42, was successfully carried out to evaluate the effectiveness of seashells in porous asphalt as a natural replacement material (aggregate).

According to Associate Professor Dr. Ramadhansyah, the main use of porous asphalt pavement is for parking lots that allow water to drain through the pavement surface into the stone recharge bed and infiltrate the soils under the pavement.

SEASHELL POROUS ASPHALT: SUSTAINABLE ROAD CONSTRUCTION



ITEX21
INTERNATIONAL TECHNOLOGY EXHIBITION 2021

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Patent
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[1] Product Background



[2] Objective

- To produce high quality of the porous asphalt incorporating seashell.
- To study the image processing of porous asphalt containing seashell.

[3] Novelty/Originality/ Inventiveness



[4] Benefits/ Usefulness/ Applicability

[5] Environmental Impact



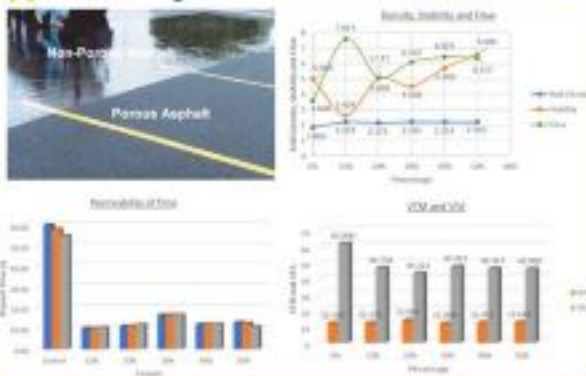
[7] Methods



[6] Marketability & Commercialisation



[8] Product Image and Product Characteristics/Results



[10] Collaboration with



Publication

[9] Cost Analysis

	Seashell Replacement	JKR / Contractor
Processing cost of seashell size 14mm	RM1.00/kg	—
The optimum percentage of seashell size 14mm used	50%	—
Consider 1km length road of width 3.75m (Requires 14mm aggregate approximate 1500kg)	New Work + Seashell	New Work
Cost of 14mm aggregate	RM 2/kg	RM 2/kg
14mm aggregate required for work (Approximate)	800 kg/km	1600 kg/km
14mm seashell required for work (Approximate)	800 kg/km	—
Total cost of 14mm aggregate for road construction in new work	RM2400/km	RM3200/km
Cost of 14mm aggregate saved (50% seashell used)	RM 800/km	—

[13] Conclusion

- Can perform well as compared to the conventional porous asphalt.
- Can be proved that the porous asphalt that containing seashell as aggregate replacement shows a different result.
- The surface of seashell able to bond with bitumen.

[12] Achievement/Award



“So far, seashells has never been used in porous asphalt pavement engineering.”

“Seashells have great potential to be used as an aggregate replacement in the design of pavement mixtures to improve road performance, especially in areas that receive heavy rainfall.

“This research started in July 2020 and completed in June 2021,” said the researcher hails from Banda Aceh, Indonesia.

He said aggregate usage in building construction and road pavements is very high at the moment.

“The large use of aggregates will create environmental problems such as the deterioration of natural earth resources.

“Therefore, this study uses seashells as an aggregate replacement material in porous asphalt mixtures.

“It is one of the alternatives to reduce the use of natural earth resources,” he said, who received his doctoral degree from Universiti Sains Malaysia (USM).

The study was conducted with a postgraduate student, Nicole Liew Siaw Ing and assisted by three lecturers, Ts. Dr. Khairil Azman Masri, Dr. Noram Irwan Ramli and Associate Professor Dr. Mohamad Idris Ali from the Department of Civil Engineering, KKEJ, UMP.

He said seashells are mixed into the main components of porous asphalt pavements as aggregate replacement materials to increase the strength and durability of the pavement.

“The use of seashells as an aggregate replacement material is expected to improve the performance of porous asphalt pavements, especially in areas that receive heavy rainfall.

“It can also be expanded in other constructions such as pedestrian walkways and concrete drain covers.

“We are also collaborating with Rland Technic Resources as a building materials manufacturer.

“Collaboration with government agencies is being worked on with the Public Works Department (JKR Malaysia) to expand the use of seashells as replacement materials for road pavement,” he said.

This research won a gold medal at the CITREx 2021 competition and a gold medal at ITEX 2021.

He also conducted research titled Waste Cooking Oil as Bio Asphalt and Waste Plastic as Green Road.

By: Safriza Baharuddin and Nur Hartini Mohd Hatta, UMP Press

Translation by: Dr. Rozaimi Abu Samah, Engineering College/Faculty of Chemical and Process Engineering Technology

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