





## SEASHELL POROUS PAVEMENT SUSTAINABLE ROAD CONSTRUCTION

**ITEX21**

INVENTOR: DR. MOHAMMAD HANIF PUTRA JAYA  
 PROJECT LEADER: DR. MOHAMMAD HANIF PUTRA JAYA  
 CO-INVENTORS: DR. MOHAMMAD HANIF PUTRA JAYA, DR. ANHUNG AZMAN, DR. MOHAMMAD HANIF PUTRA JAYA, DR. MOHAMMAD HANIF PUTRA JAYA  
 MURALI BR. MOHAMMAD HANIF PUTRA JAYA, PROF. DR. MOHAMMAD HANIF PUTRA JAYA

Patent: No. 10/2021/0010/2021

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

**Product Background**  
 Seashell waste + Asphalt = Seashell Porous Asphalt

**Novelty/Originality/Inventiveness**  
 Reduce asphalt price  
 Reduce weight in the pavement  
 Reduce traffic noise  
 Reduce the amount of water runoff

**Environmental Impact**  
 Reduced carbon footprint  
 Reduced energy consumption  
 Reduced water runoff  
 Reduced noise pollution  
 Reduced air pollution  
 Reduced water pollution

**Marketability & Commercialisation**  
 The product of seashell and asphalt is environmentally friendly and sustainable. It can be used for road construction, drainage system, and other applications.

**Product Image and Product Characteristics-Results**  
 The product is a porous asphalt containing seashell. It has a high permeability and low water absorption. The product is also lightweight and durable.

**Collaboration with**  
 ITEX21

**Conclusion**  
 Se 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 also to bind with bitumen.

**Achievement/Award**  
 Gold Medal CITREX 2021

**Publication**

Table with 3 columns: Material, Quantity, and Price. The table lists various materials used in the project, including Seashell, Asphalt, and Bitumen.

Material	Quantity	Price
Seashell	100 kg	100,000
Asphalt	100 kg	100,000
Bitumen	100 kg	100,000
Aggregate	100 kg	100,000
Water	100 kg	100,000
Sand	100 kg	100,000
Gravel	100 kg	100,000
Crushed Stone	100 kg	100,000
Crushed Shell	100 kg	100,000
Crushed Brick	100 kg	100,000
Crushed Concrete	100 kg	100,000
Crushed Glass	100 kg	100,000
Crushed Plastic	100 kg	100,000
Crushed Paper	100 kg	100,000
Crushed Wood	100 kg	100,000
Crushed Rubber	100 kg	100,000
Crushed Metal	100 kg	100,000
Crushed Fabric	100 kg	100,000
Crushed Leather	100 kg	100,000
Crushed Glass	100 kg	100,000
Crushed Plastic	100 kg	100,000
Crushed Paper	100 kg	100,000
Crushed Wood	100 kg	100,000
Crushed Rubber	100 kg	100,000
Crushed Metal	100 kg	100,000
Crushed Fabric	100 kg	100,000
Crushed Leather	100 kg	100,000

---

[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**

**INVENTOR** : ASSOC. PROF DR. RAMADHANSYAH PUTRA JAYA  
**FACULTY** : COLLEGE OF ENGINEERING  
**UNIVERSITY** : UNIVERSITI MALAYSIA PAHANG  
**EMAIL** : ramadhansyah@ump.edu.my  
**CO-INVENTORS** : NICOLE LIEW SIAW ENG, TS. DR. KHAIROL AZMAN MASRI, DR. NORAM IRWAN RAMLI, ASSOC. PROF DR. MOHAMAD IDRIS ALI



**Patent**  
 PI 2021007106 Filed 28/11/2021

## [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

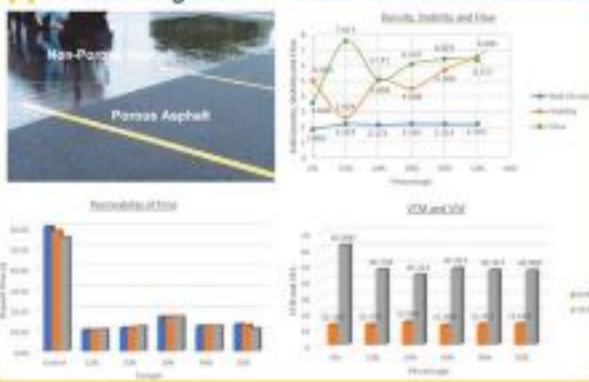


## [7] Methods



## [6] Marketability & Commercialisation

## [8] Product Image and Product Characteristics/Results



## [10] Collaboration with

[11] 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

Gold Medal CITREX 2021

“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**

