

Patent

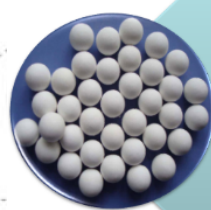
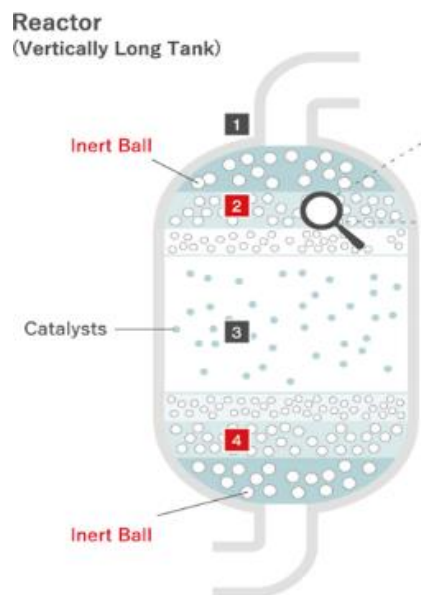
1. UI2021001079 dated 01 March 2021
2. UI2019000774 dated 13 February 2019

HIGH STRENGTH INERT CERAMIC BALLS

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CO-INVENTORS: Assoc Prof Dr Hanafi Ani (IIUM), Hj Abd Razak Ahmad (Rakannusa Sdn Bhd)



Product Background



To develop sintered inert ceramic (balls) from Malaysian clays to meet industrial requirement for Malaysian oil and gas industries, oleochemical, fertilizer, gas processing and acid separation.

State of the Art/ Methods

Powder metallurgy route: Grinding, sieving, mixing, doghing/forming, drying, sintering



Novelty/ Originality/ Inventiveness

- Formulation of inert ceramic content based on Malaysian resources
- Highest fracture strength

Benefits/Usefulness/ Applicability

FULLFILL MARKET NEEDS:

Currently, Malaysia requires 5,000 Tonnes per year. Next for 5-10 years will be 10,000 Tonnes per year.

COMPETITIVE ADVANTAGES AND MARKETABILITY:

1. Product quality (Comply with UOP standard)
2. Made to order, specific to customer requirement.
3. Produce locally so reduce the delivery time
4. Raw material available locally
5. No import duty

Status of Innovation

- Prototype
- Patent file: UI2021001079 dated 01 March 2021
- Patent file: UI2019000774 dated 13 February 2019
- MOA between UMP-Rakannusa-IIUM

Achievement/Award

- GOLD CITREX, 2020
- GOLD ITEx, 2020
- MyLAB: RM514,000

Product Product Characteristics/Results

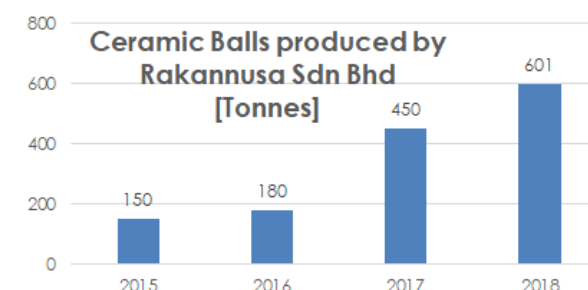
Dimension	UOP Specification	Benchmark product (RC500)	New Invention
Chemical composition			
Al ₂ O ₃ + SiO ₂	≥ 90 %	≥ 90%	96%
SiO ₂	≤ 80 %	< 80%	73%
Al ₂ O ₃		> 13%	23%
Physical requirement			
Shape	Spherical	Spherical (handmade)	Spherical (handmade)
Water absorption [%]	≤ 0.9	0.1	0.16
Density [gr/cm ³]	≥ 2.160	2.30	2.30
Drop test (6 meter)	No fractured	No fractured (8m)	No fractured (8m)
Crushing strength (min.) - 12.7 mm Ø [kgf]	163	471	497 - 602
Porosity [%]	N/A	0.15	0.14

Marketability & Commercialisation

The World market and Malaysia market of ceramic balls.

World market (ceramic balls)	
2018	2023 (projection)
USD 433.0 million	USD 636.3 million

Malaysian market	
2018	2023 (projection)
5000T (RM 20 million)	10000T (RM 50 million)



Cost Analysis

- Market price (India/China): RM6/kg
- RC500: RM12/kg
- New invention: RM3/kg

Publication (Scopus indexed)

2019 - AGE Sutjipto, A Hisyam, N Salim, MH Ab Rahim, A Legowo, MH Ani. Development of inert ceramic for industrial application based on ternary phase diagram of potassium oxide-aluminum oxide-silicon dioxide. *ASET 2019*. IEEE. 1-4.

Environmental Impact

- Inert materials
- Environmental friendly

Collaboration/Industrial Partner

Rakannusa Sdn Bhd

IIUM

