# Highly Efficient Removal of Enteric Bacteria from Water with Hybrid Clay Composite

*Presented by:*

**Unuabonah, Emmanuel I. (PhD)**
**Deepartment of Chemical Sciences**

REDEEMER'S UNIVERSITY
...running with a vision

www.run.edu.ng

# Introduction

- ~ 2 billion people today drink contaminated water
- Microbial contamination of drinking water: a global concern
- Waterborne Diseases
  - Cholera (*Vibrio cholera*)
  - Diarrhea and Dysentery (*E. coli*)
  - Food poisoning and Typhoid (*Salmonella typhi*).

# Disinfection of Water

The process of removing, deactivating or killing the pathogenic microorganisms in water, in order to de-contaminate the water.

- Methods for disinfecting water
  - Membrane Technology
  - Ozonation
  - Ultraviolet radiation
  - Chlorination
  - Adsorption
  - Photocatalysis

# Material Preparation

## Materials

*Kaolinite clay*

+

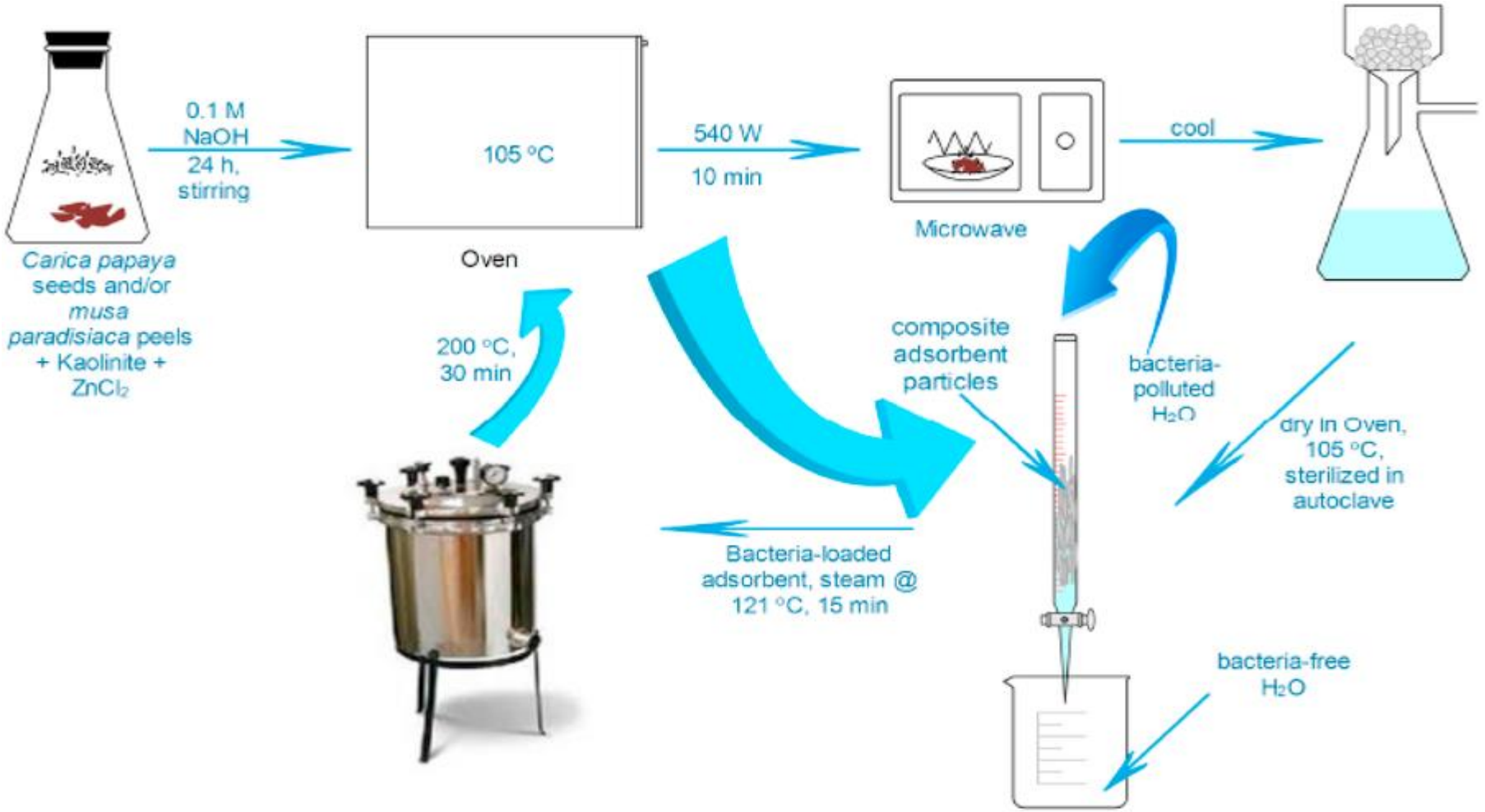
*Carica papaya* **seeds**

+

**$ZnCl_2$**

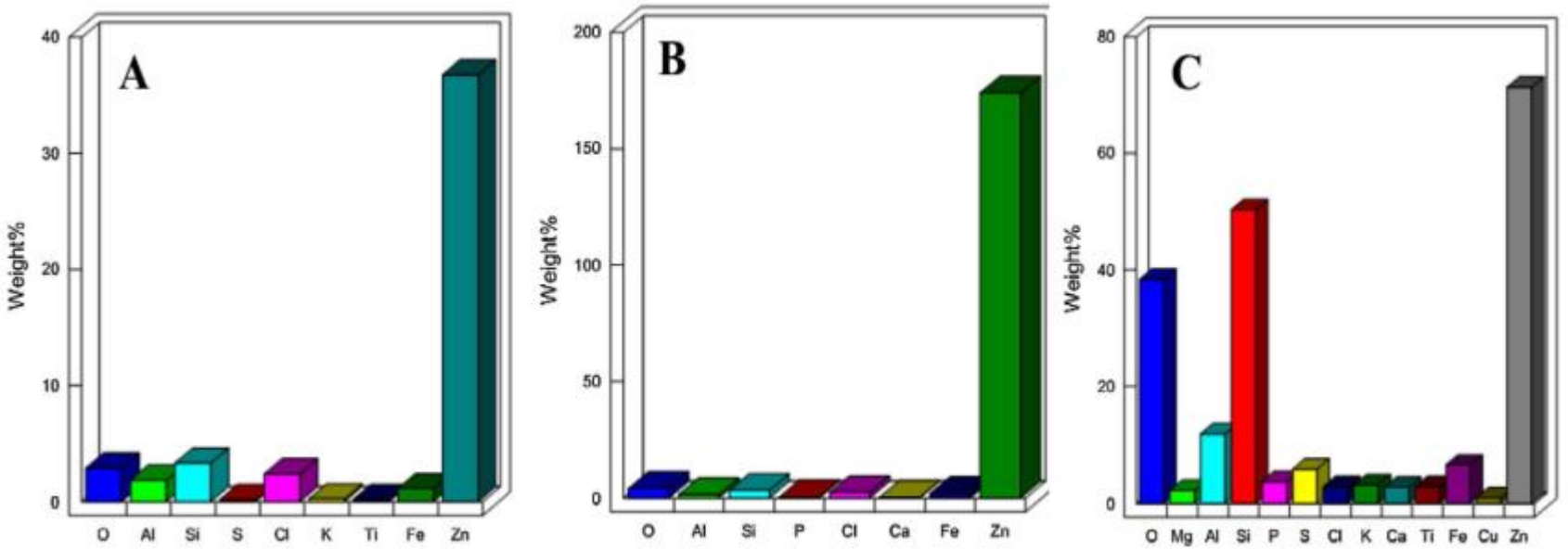
+

**NaOH**




**Scheme:** Preparation and application of bacteriostatic composites for removal of enteric bacterial from water

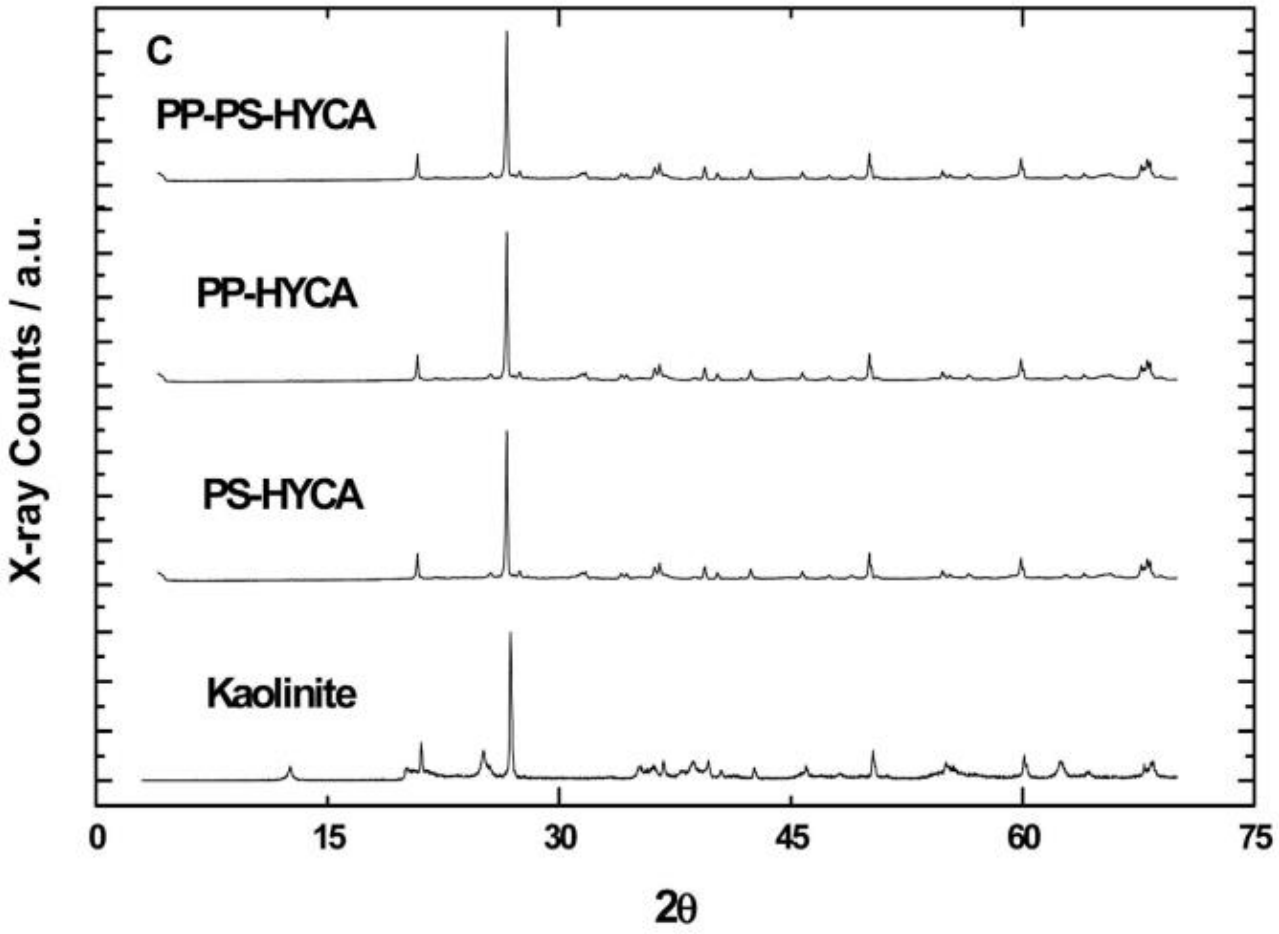
# Energy Dispersive X-ray Spectroscopy

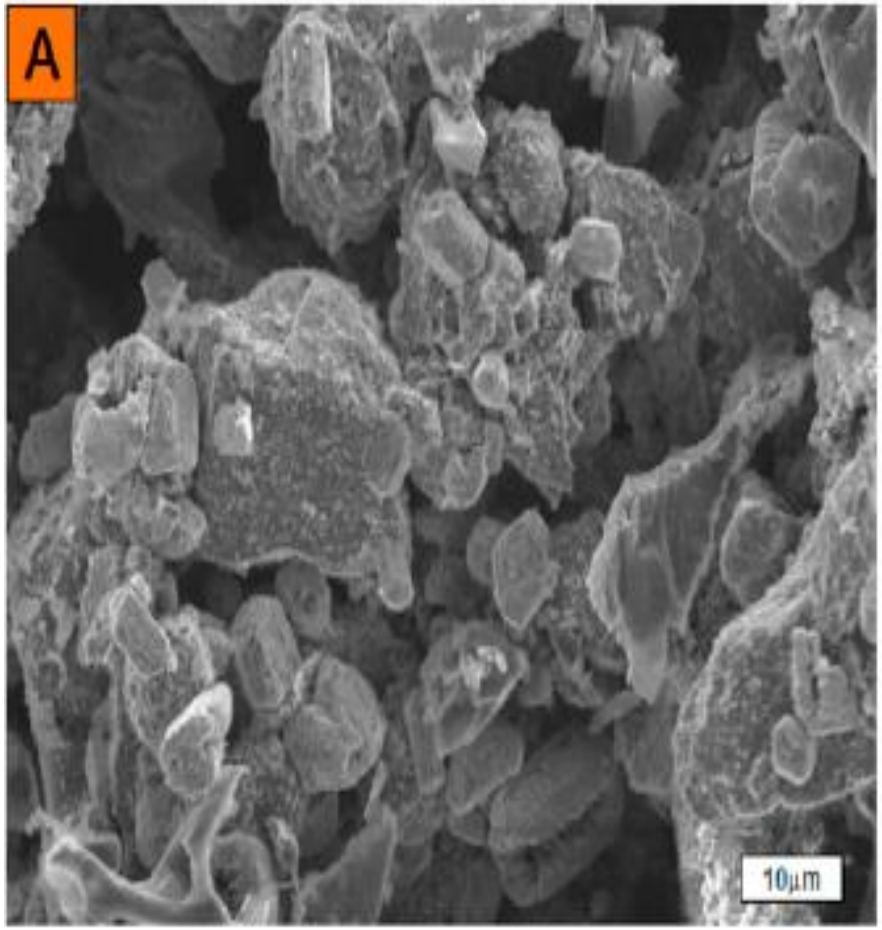


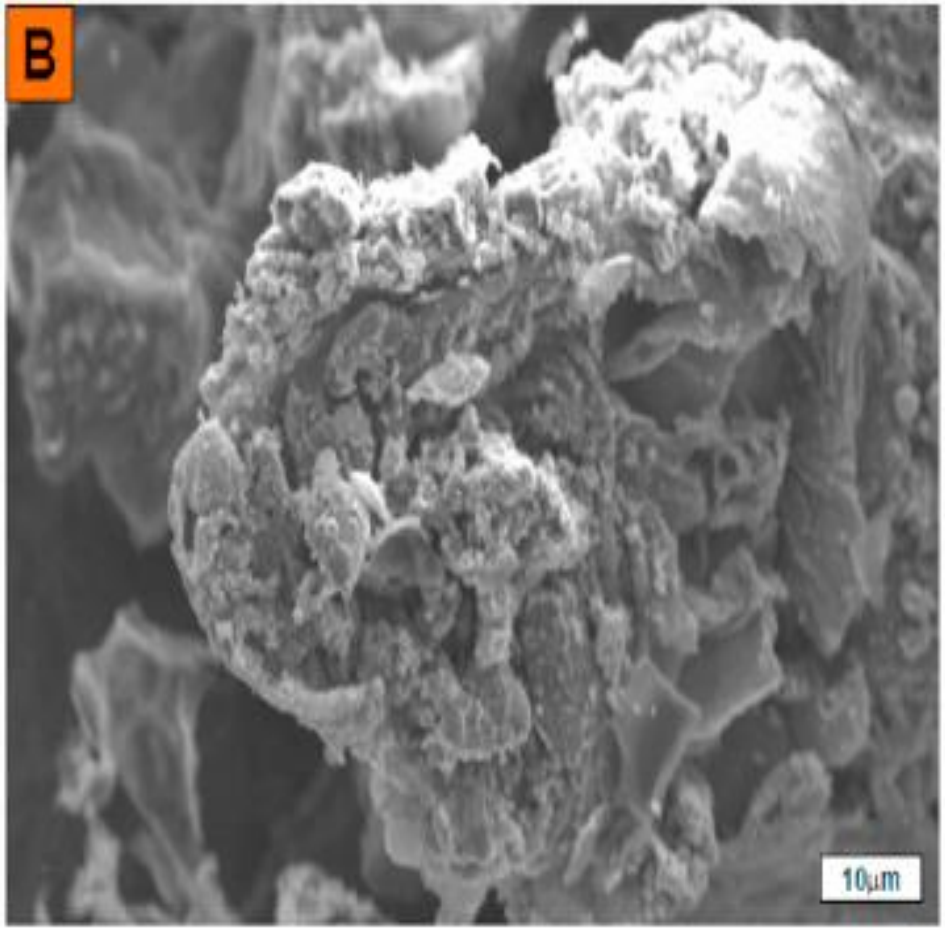

A = PP-HYCA; B = PS-HYCA; C = PP-PS-HYCA

PP = plantain peel
PS = papaya seeds

# X-ray Diffraction

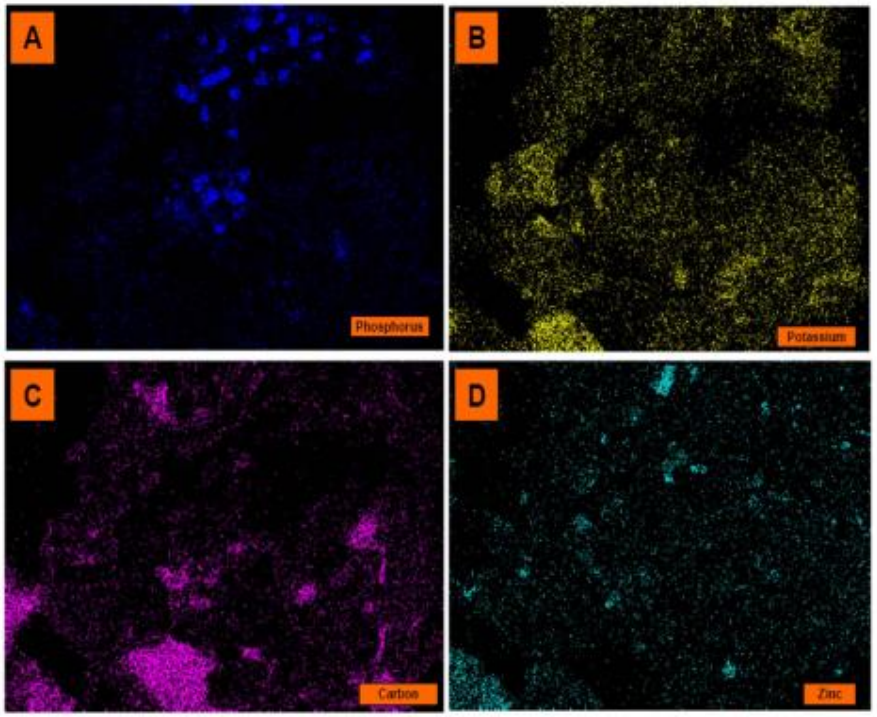



A
10µm

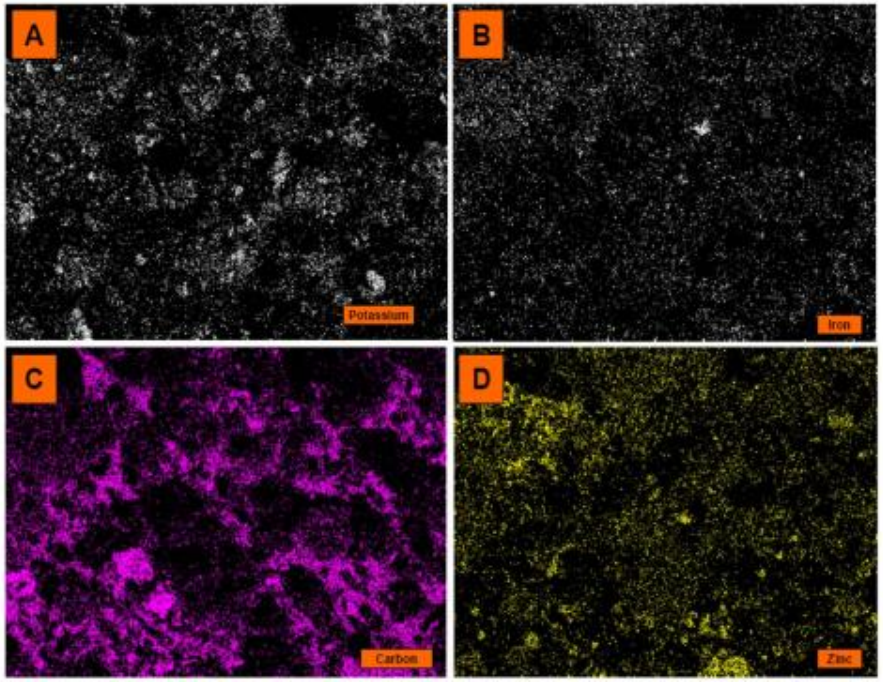

B
10µm

# Elemental Mapping Images

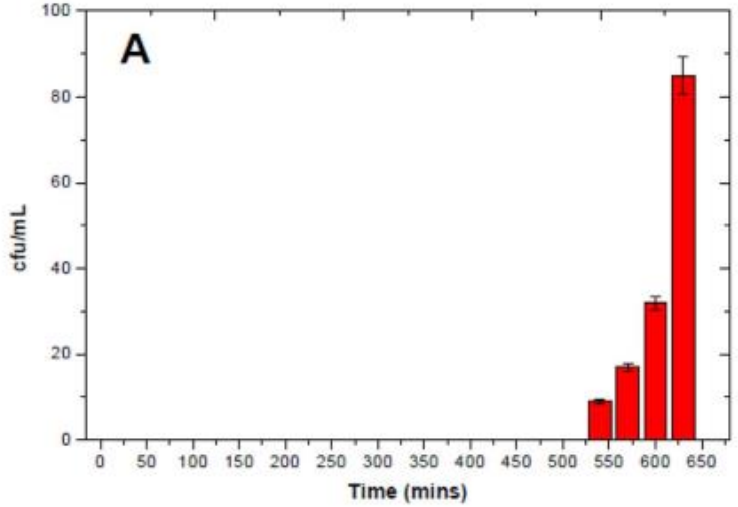
I

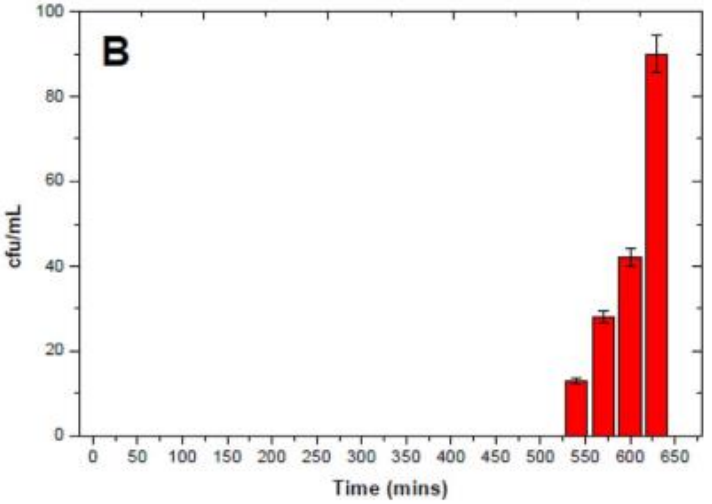


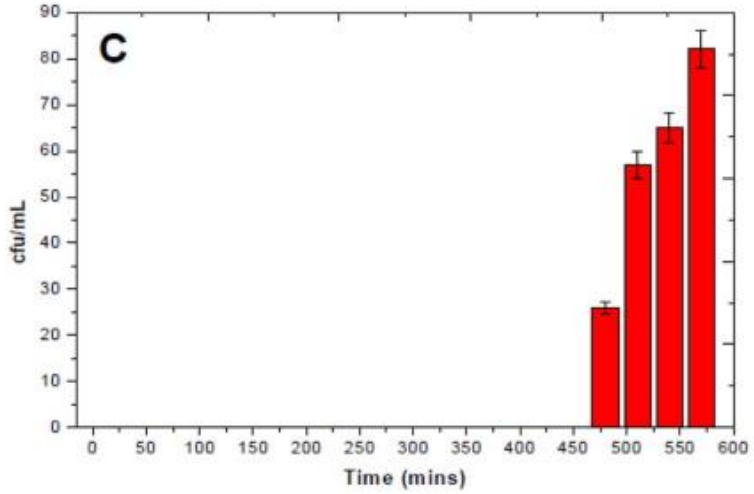

II



# Breakthrough Results



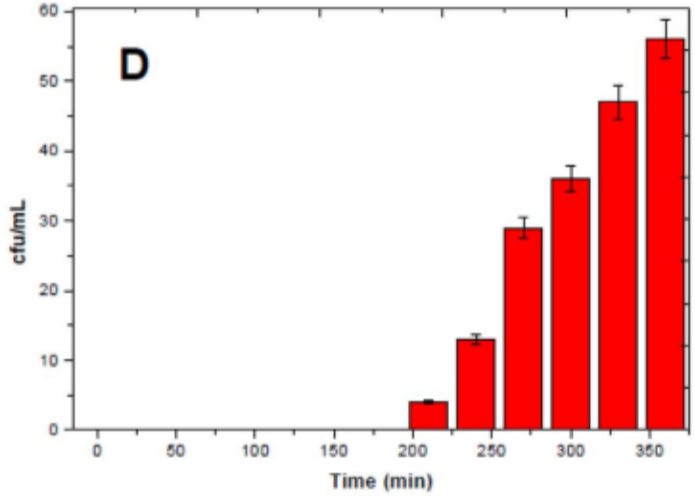



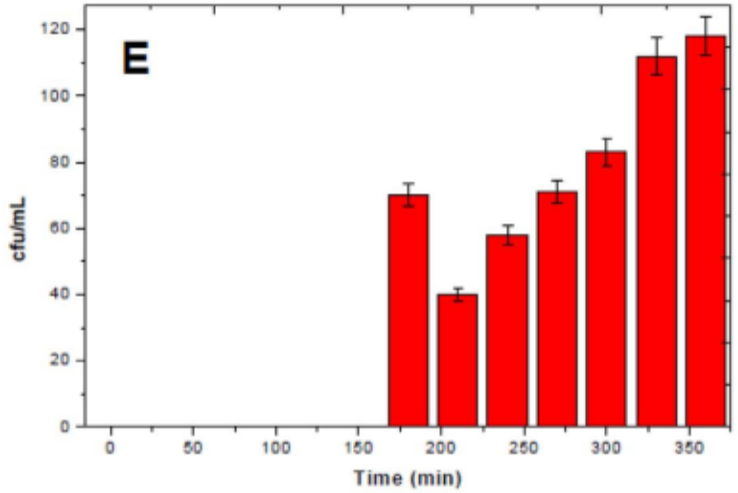



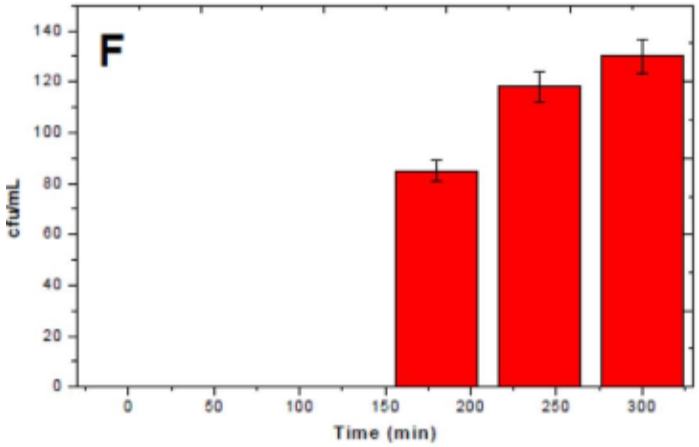

REDEEMER'S UNIVERSITY
Running with a vision

twas

# Breakthrough Results (contd)



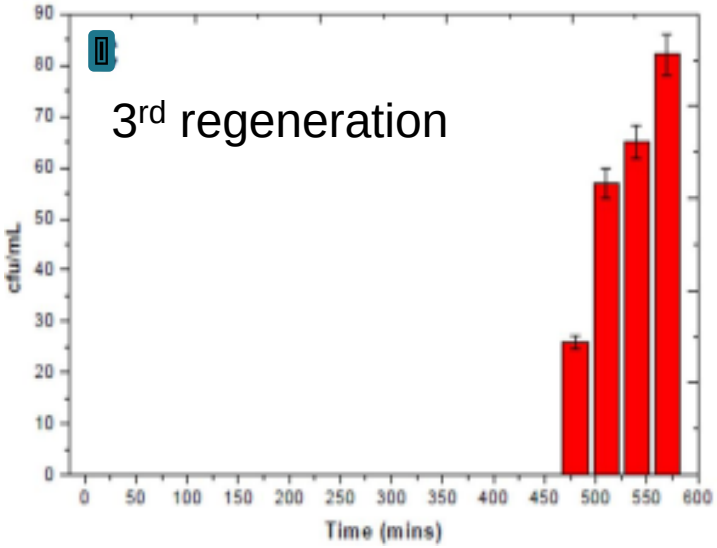



# Regeneration

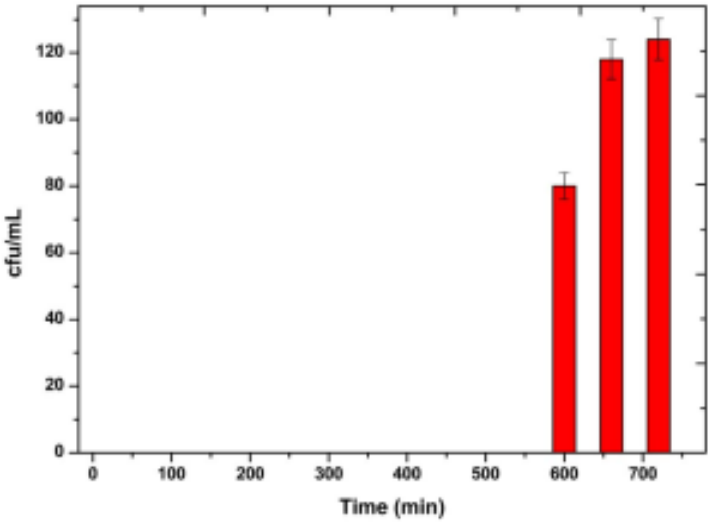
- At $10^3$ cfu/mL of bacteria load in solution Composite clay material kept the level of the bacteria at zero for up to 36 h

- Steam regeneration vs Ultrasonic methods




Oven

200 oC/30min



# Appreciation

- My colleagues on this project
- The students, Koko Terlanga and Leonard Ugege



# THANK YOU

REDEEMER'S UNIVERSITY
Running with a vision

twas