



IMPROVEMENT OF CONCRETE DURABILITY **BY BACTERIAL MINERAL** **PRECIPITATION**

Presented by

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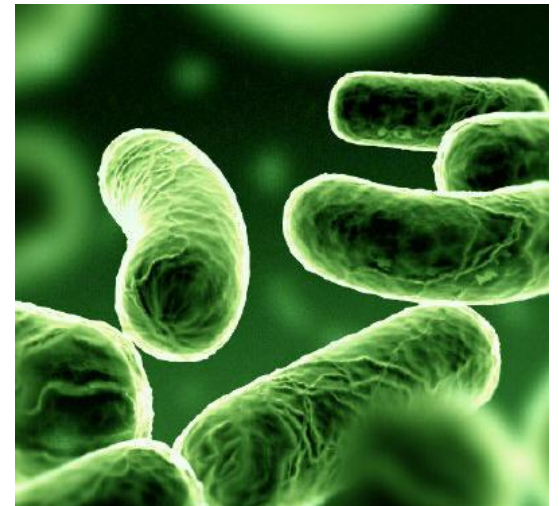
Tiruvannamalai.



INTRODUCTION:

➤ *Bacillus Pasteruii*, a common soil bacterium, can continuously precipitate calcite under favourable conditions .This phenomenon is called **microbiologically induced calcite precipitation**.

➤ Due to its inherent ability to precipitate calcite continuously bacterial concrete can be called as a “**Smart Bio Material**”.



OBJECTIVES:

- To study the effect of different concentrations of bacteria on the durability of concrete.
- To study the efficiency of bacteria when suspended in different mediums (water, phosphate and urea)

MICRO-ORGANISMS AND GROWTH CONDITION:

- A stock culture of *B.pasteurii* is generally maintained in a solid medium containing:

- ✓ 10g trypticase

- ✓ 5g yeast extract

- ✓ 4.5g tricine

- ✓ 5g ammonium sulphate

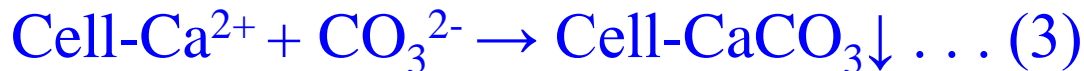
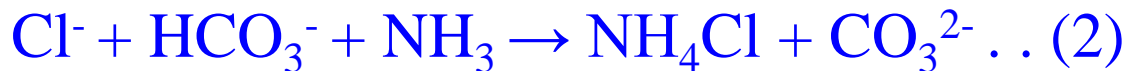
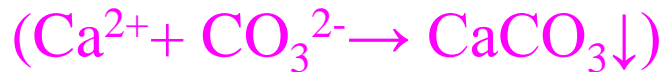
- ✓ 2g glutamic acid



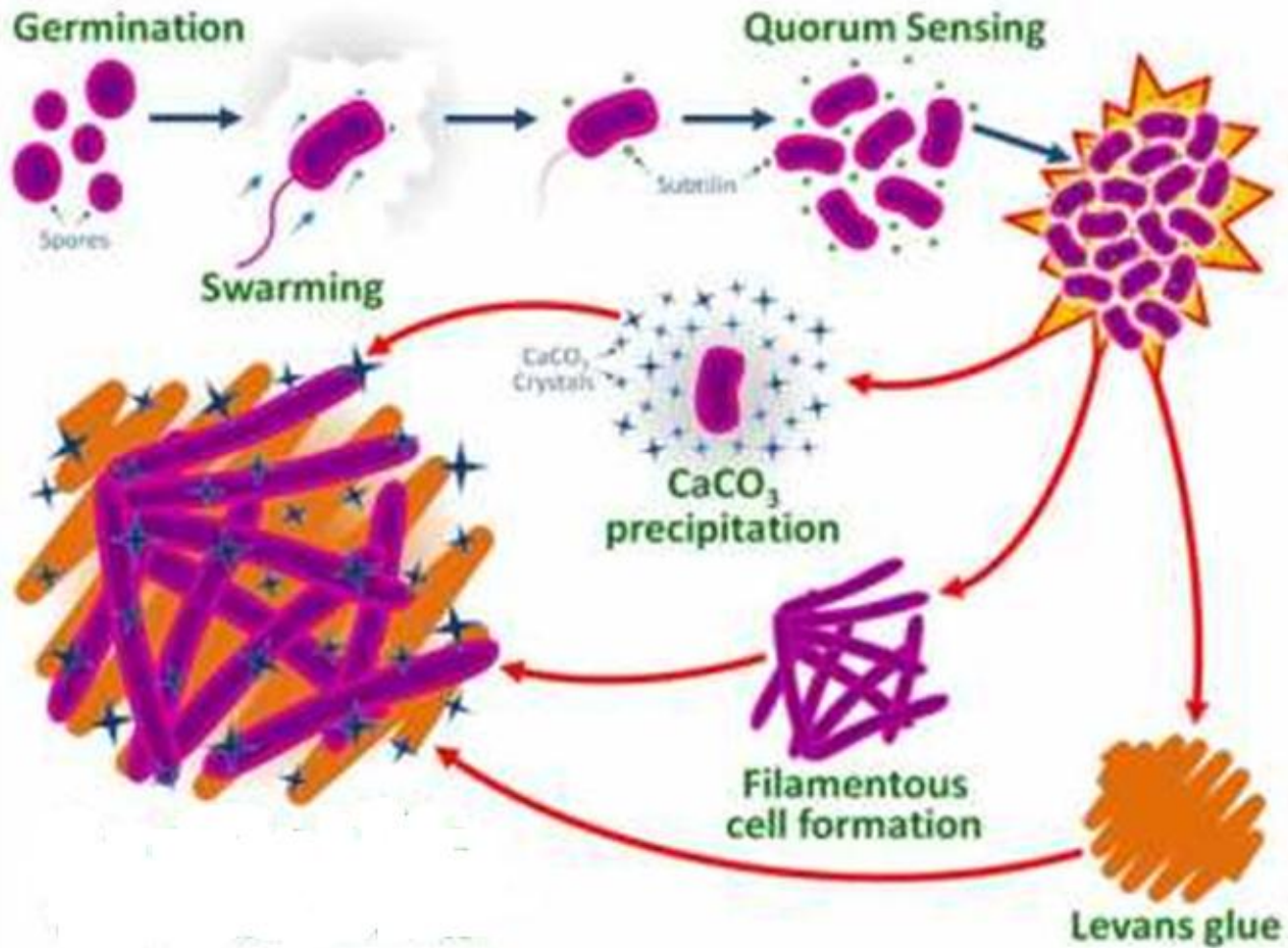
And final concentration of 1.6% agar, which is autoclaved separately and added after-wards.

CHEMISTRY OF THE PROCESS:

- Microbiologically enhanced crack remediation (MECR) utilizes a biological by-product, CaCO₃.
- The overall chemical equilibrium reaction of calcite precipitation is,



FUNCTION:



DISCUSSION:

- The effects of the following parameters on the durability of concrete were investigated:
 - Bacteria suspended in water (BW).
 - Bacteria suspended in urea-CaCl₂ (BU).
 - Bacteria suspended in phosphate buffer (BP)

FACTORS :

- As per [IS456:2000](#) the following are the some of the important factors which affect the durability of concrete
 - * Impermeability
 - * The environment
 - * The type and quality of constituent materials
 - * The water/cement ratio of the concrete
 - * compaction and efficient curing

COMPRESSIVE STRENGTH OF REMEDIATED CUBES:



Cube drilled to a depth of 2 CM



Testing of Cubes
sealed with the bioconcrete

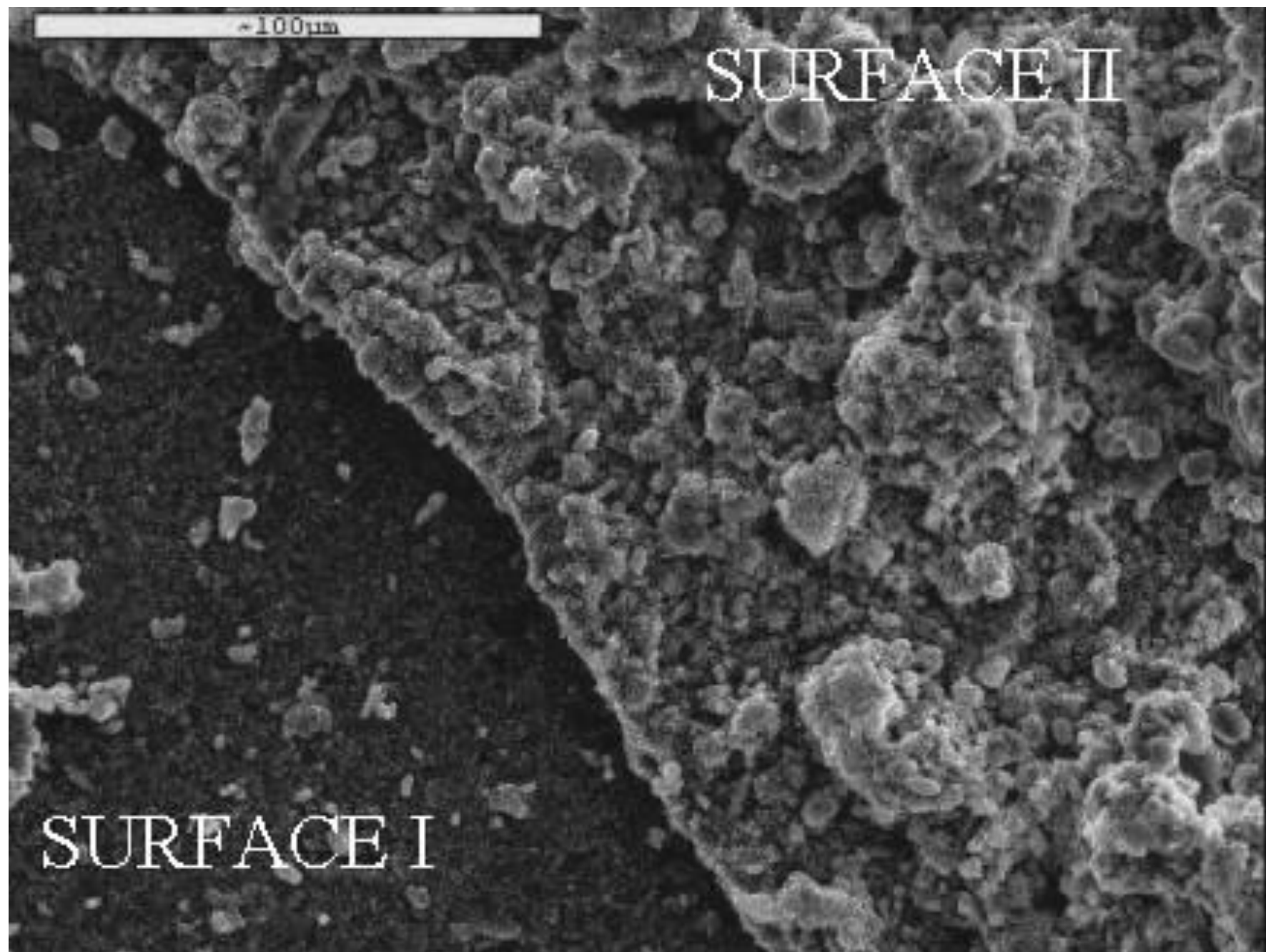
TEST RESULT:

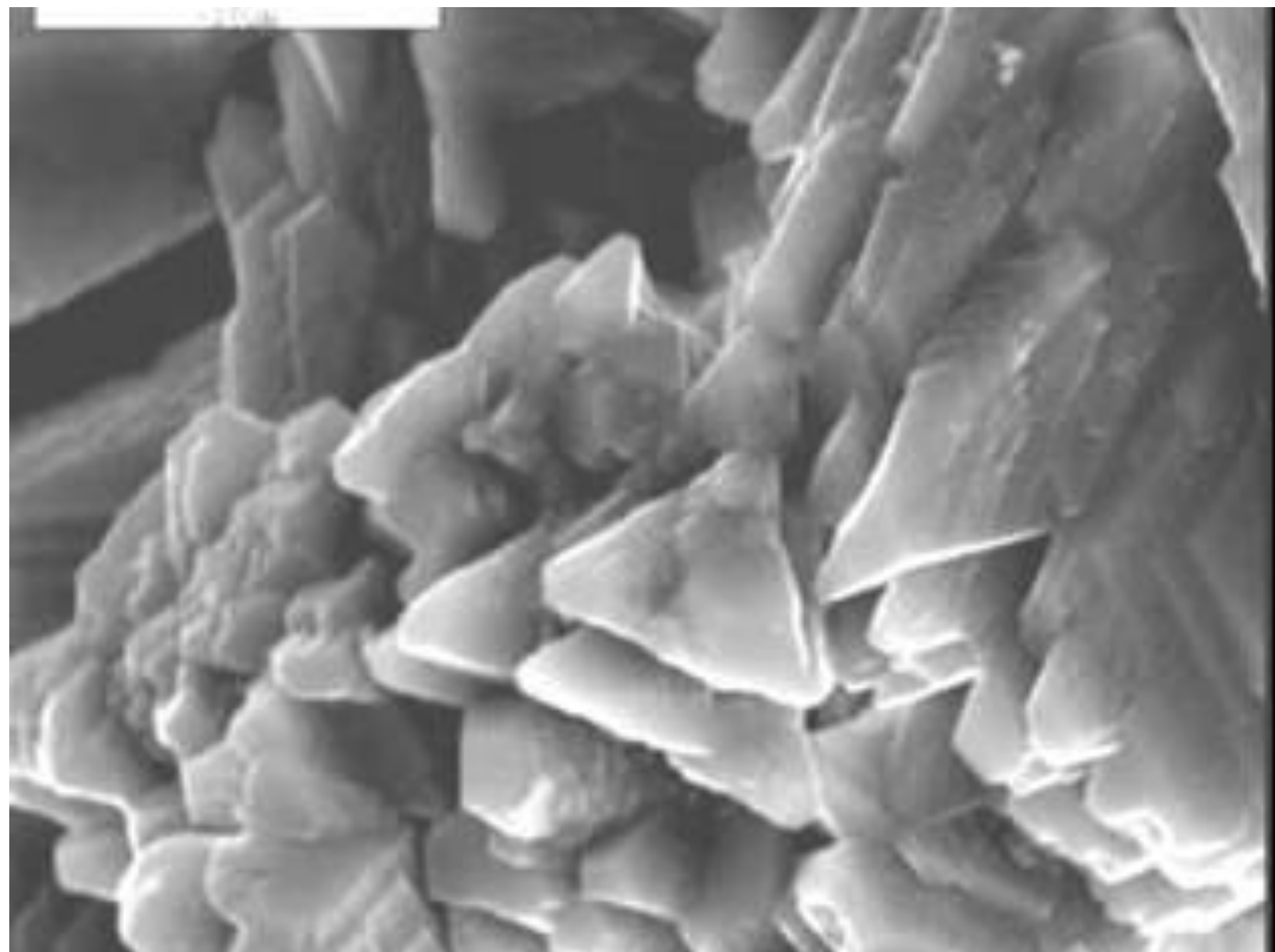
Description of specimen	Strength N/mm²
Control (concrete without crack)	33.33
Cracked specimen	26.66
Remediated specimen	30.22

~100 μ m

SURFACE II

SURFACE I

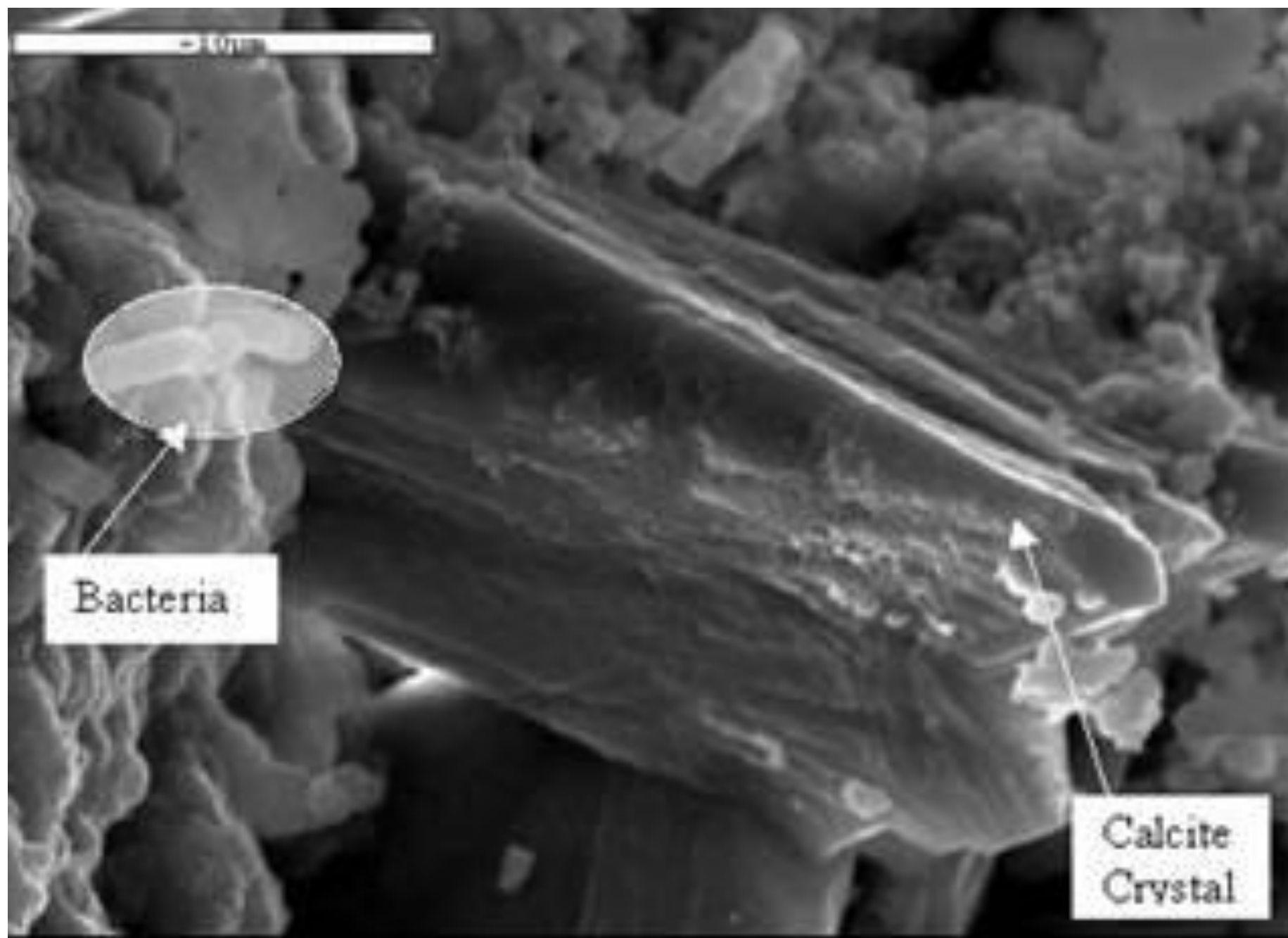


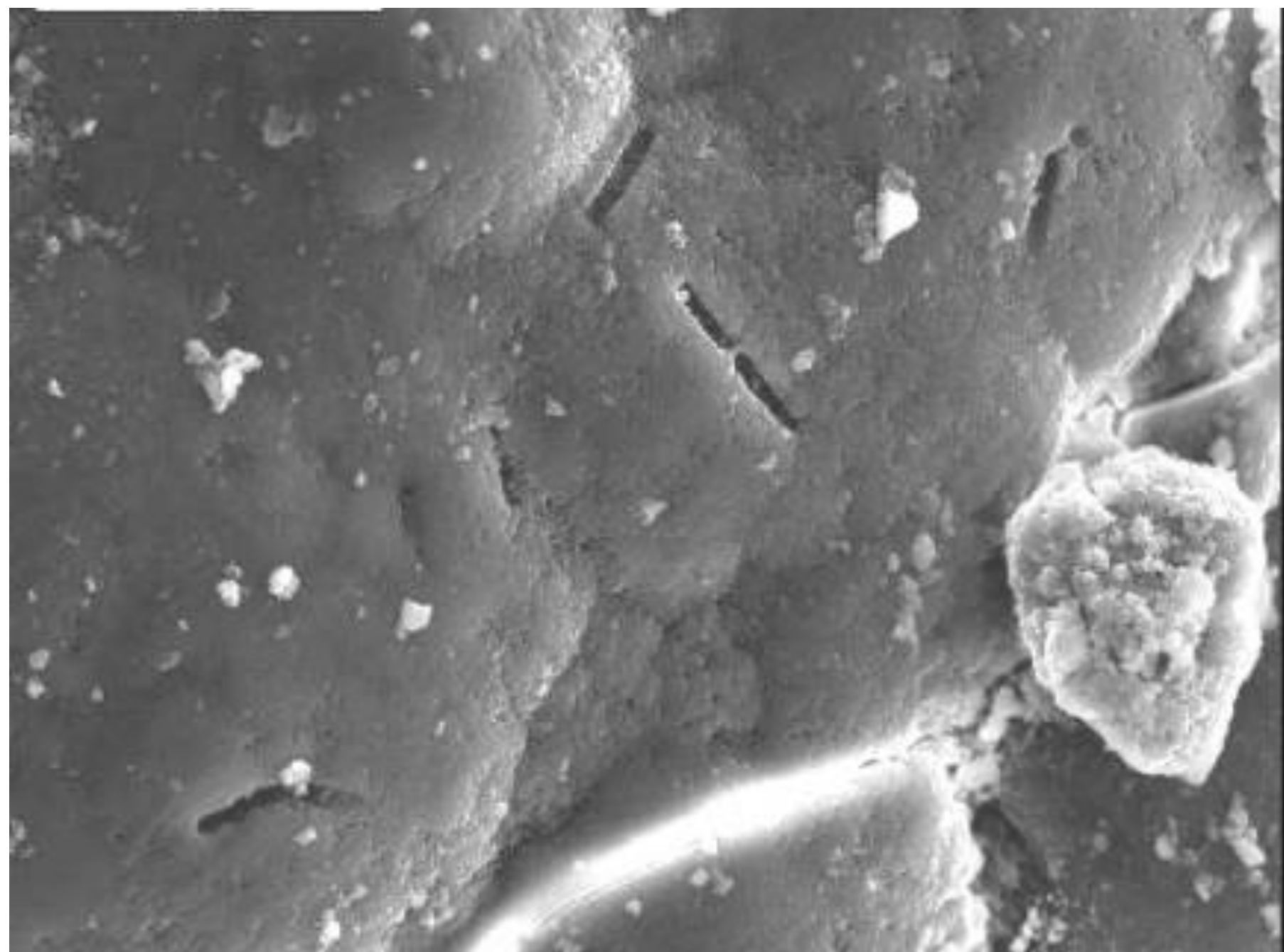


10 μ m

Bacteria

Calcite
Crystal






MERITS:

- ✓ More resistance to the freezing and thawing condition
- ✓ Reduce plastic shrinkage cracks
- ✓ High impermeability
- ✓ High resistance to chemical attacks

CONCLUSIONS :

- The presence of bacteria in different mediums increased the resistance of concrete towards alkali, sulphate, freeze-thaw attack and drying shrinkage.
- Phosphate-buffer proved to be an effective medium for bacteria than the other two mediums
- The compressive strength of bacterial concrete is also increased by 5% to 10%.

The background of the image is a grey, textured surface representing a concrete wall. A prominent, jagged crack runs diagonally from the top right towards the bottom left, passing through the text. There are also some faint, vertical lines on the wall, possibly from construction joints or rebar.

CONCRETE CRACK INJECTION

For Repairing

Cracked Poured Walls

Thank you

Queries ???

