Literature Review

2.1 Introduction

Very limited literatures are available on the use of favourable microorganisms in mortar/concrete recently. The overall behavior of such mortar/concrete is becoming an important area of research. However, a comprehensive review on the available literatures on the effect of microorganism on concrete is presented. Both the harmful and beneficial effects of microorganism on mortar/concrete are discussed here.

2.2 Harmful Effects of Microorganisms in Concrete

Concrete is generally resistant to microbiological attack because of its high pH nevertheless, under certain, fortunately rare, tropical conditions, some algae, fungi and microorganism can use atmospheric nitrogen to form nitric acid which attacks concrete. The mechanisms also release some corrosive chemicals through metabolic activity and create an environment, which promotes corrosion of steel. The usual agent in bacterial attack is an organic or mineral acid that reacts with hydrated cement paste. Initially, the alkaline pore water in hydrated cement paste neutralizes the acid. Continuing action of bacteria results in deeper attack. The rough surface texture of concrete usually shelters the bacteria and thus surface cleaning is also ineffective. Therefore, it is necessary to incorporate some special admixtures in the concrete mix that is toxic to the attacking organisms. These may be anti-bacterial, fungicidal or insecticidal. It may also be noted that addition of copper sulfate and pentachlorophenol have been found to control the growth of algae or lichen on hardened concrete but its effectiveness is lost with time. Among the numerous cements developed for special uses, anti-bacterial cement is used in the world today. Portland cement with an anti-bacterial agent normally prevents microbiological fermentation. This bacterial action is encountered in concrete floors of food processing plants where the leaching out of cement by acid is followed by fermentation caused by bacteria in the presence of moisture. Anti-bacterial cement can also be successfully used in swimming pools and similar places where bacteria or fungi are present.
In 2000, J. Monteny et al.\textsuperscript{18} in Belgium had shown the chemical, microbiological, and in \textit{situ} test methods for biogenic sulfuric acid corrosion of concrete. Biogenic sulfuric acid corrosion is often a serious problem in sewer environment. It can lead to a fast degradation of the concrete structures. After the involvement of bacteria in the corrosion process was discovered, considerable microbiological research has been devoted to the understanding of the corrosive process. Biogenic sulfuric acid corrosion is often a slow and a very complex process. It would require several years to investigate the difference in the durability of various materials. It comprises the microbiological aspect of the \textit{Thiobacilli} bacteria, which transform sulfur to sulfuric acid. The action of the sulfuric acid can be seen as a purely chemical aspect that causes the chemical destruction of some components of the concrete. There are also mechanical aspects involved such as the crystal pressure due to growth of ettringite and the removal of the corroded concrete layer by sewage flow. Because of the complexity of the process due to these different aspects and their interactions, researchers tried to simulate corrosion as it happens in situ. By creating optimum conditions for the bacteria, which are not always present, in situ, the rate of corrosion can be increased. As part of a wide-ranging project to investigate deterioration of concrete caused by metabolites of aerobic microorganisms, Tazawa et al\textsuperscript{19-20} performed some experiments with sulfide-producing and sulfur-oxidizing bacteria. These bacteria were isolated from an underground structure in which biological deterioration occurred. It was thought that mainly organic acids and carbonic acid caused the entire deterioration of the underground structure, which is common metabolite of all microorganisms. Additional external factors, which contribute to the deterioration process, were the production of sulfuric acid and hydrogen sulfide by oxidation and reduction reaction of bacteria. The sulfuric acid then reacts with cement hydrates producing ettringite. This complex salt can be decomposed by carbonic or bi-carbonic acid and organic acids produced by bacteria. By repetition of production and decomposition, the concrete becomes porous and weak. The relationship between several species of \textit{Thiobacilli} and the corrosion of concrete was investigated experimentally\textsuperscript{21}. Hydrogen sulfide acted as a substrate for the bacteria and the concentration was maintained at 10 ppmv. The weight loss of the concrete beam specimens of $60 \times 11 \times 7$ cm kept under stimulation chamber\textsuperscript{21} with spraying continuously by \textit{Thiobacilli} cultures
was determined as a measure for corrosion. During the experiment, the number of cells of different groups of *Thiobacilli* on concrete surface was counted. The change of the \( p\text{H} \) of the concrete surface was also maintained. It is noted that the rate of corrosion was more with the increase in the number of *T. thiooxidans*. These organisms depress the \( p\text{H} \) of the concrete surface to values between 1 and 3. The influence of sulfur source on the corrosion of concrete was also investigated. Three different types of sulfur source—hydrogen sulfide, methylmercaptan, and sodium thiosulfate—were used as a substrate for the bacteria. The concentration of hydrogen sulfide and methylmercaptan in the air above the water were maintained at 10ppmv as monitored by gas chromatography. The sodium thiosulfate was solved in a mineral solution and spread over the concrete blocks. Measuring the weight loss of test specimens and the \( p\text{H} \) of the surface water, in which the concrete blocks were placed, was monitored in the experiment. The quantity of the heterotrophic organisms and fungi grown on the concrete surface was also measured. The corrosion in the case when \( \text{H}_2\text{S} \) gas was used—about 1.8 times higher than the corrosion measured when thiosulfate was used as a sulfur source. When methylmercaptan was used, no corrosion was found. The reason was that *Thiobacilli* as a substrate does not use methylmercaptan or other derivate products.

In 2000, **M.A Shirakawa** et. al.\(^{22}\) of the Department of Microbiology, Institute of Biomedical Sciences, University of Sao Paulo, Brazil presented a paper on the development of a method to evaluate bio-receptivity of indoor mortar plastering to fungal growth. The aim of this work was to develop and standardize an accelerate laboratory test for detecting bio-receptivity of indoor mortar to fungal growth. To determine which fungal species were predominant under field conditions, isolation was carried out using mortar samples collected from 41 buildings in two cities of Sao Paulo State in the South East of Brazil. *Cladosporium* was found to be the genus most frequently recovered from field specimens. Based on the results of laboratory trials strain *C. sphaerospermum* was chosen as a test microorganism. Four different mortars—two laboratory manufactured mortars composed of ordinary Portland cement, high calcium hydrated lime and standardized sand, and two different ready-mixed building mortars from the Brazilian market, were investigated for their susceptibility to colonization by *C. sphaerospermum*. 
Interaction of *C. sphaerospermum* with mortar specimens was studied using techniques of scanning and environmental scanning electron microscopy combined with energy dispersive X-ray analysis. Several parameters were tested to determine factors influencing fungal bio-receptivity. It was concluded that the type of mortar, degree of carbonation and pH values of mortars, as well as relative humidity of environment affected colonization of *C. sphaerospermum*. All except one mortar samples showed significant fungal growth. However, the growth occurred only at 100% relative humidity.

A research paper on the corrosion of concrete by bacteria in sewage systems and inhibitory effects of formates on their growth has been published by Tateo Yamanaka *et. al.*\(^{23}\) in 2001. In this study, the bacteria participating in the corrosion of concrete in several sewerage systems in Japan were investigated. Different species of sulfur oxidizing bacteria (*T. neapolitanus, T. thiooxidans*) appeared in to be present in different systems. An acidophilic iron- oxidizing bacterium (or bacteria) was also found in the corroded concrete. When a concrete test piece was exposed in sewage system to atmosphere containing hydrogen sulfide of concentrations more than 600 ppm, the surface pH of the piece was usually lowered to approx 2 or less after a month when checked with pH test paper. The rapid lowering of the surface pH of the piece especially under the higher concentrations of hydrogen sulfide is not consistent with the idea that the bacteria grow on the concrete after its surface has been neutralized by carbon dioxide. The acidification of the surface of the concrete in the sewerage systems at the higher concentrations of hydrogen sulfide was explained here. Moisture condenses as a water layer containing hydrogen sulfide on the surface of the concrete, and the bacteria oxidize hydrogen sulfide to produce sulfuric acid in the thin water layer. As the water layer is probable like a big swimming pool for the bacteria, they will be able to grow in the layer even when the pH of the concrete surface 12-13. The behavior of bacterial corrosion in a sewerage system occurred from surface to inner parts was also investigated based. The bacterial activity and the pH were measured from concrete powdered samples from different strata (Strata-I - 2.5 cm from outer surface, Strata –II - 1.0 cm width, Strata-III – 0.5cm width and Strata –IV –inner strata). The pH of strata-I and II were 2.15 and 2.76 respectively and the bacterial activities in these strata were significant. Although the pH
of the stratum –III was also fairly acidic 3.11, the bacterial activity of this stratum seemed to be very low. The bacterial activity is almost zero in stratum –IV. Similar results were also obtained by Mori et.al\textsuperscript{24}. However, the inhibitory effects of formates on the growth of the bacteria should be confirmed by exposing the concrete test specimens containing formats of hydrogen sulfides in sewerage systems by future study.

In 2003, Lawrence L. Sutter and Tom Van Dam\textsuperscript{25} had preliminary investigated the role of bacteria in concrete degradation. Various types of bacteria are commonly found in nature and are known to interact with inorganic materials in a variety of ways. Like any life form, their metabolic activity and by-products can chemically alter their surroundings. This has been well documented in the case of \textit{Thiobacillus} species. Two common strains are the \textit{Thiobacillus thiooxidans}, which oxidize sulfur as part of their metabolic cycle, and the \textit{Thiobacillus ferrooxidans}, which oxide iron. Acidophilic organisms are the most likely to cause damage in concrete and have been known to cause severe damage in concrete sewer pipes. In sewers, hydrogen sulfide, generated by anaerobic sulfate reducing bacteria, is transported to the wall and crown of the pipe, where the sulfur is oxidized to sulfuric acid. The acid then reacts with calcium hydroxide, destroying the concrete. Whether these organisms are viable and active in concrete roads and bridges is not known. There are reasons to suspect that bacteria or other organisms may be present in concrete structures but there are also reasons to doubt their presence. In support of their viability, evidence has been presented that bio-organisms are present in concrete that has deteriorated prematurely. Additionally, at the pavement joint, the pH can typically be much lower than that of normal concrete due to carbonation and exposure to the groundwater. These conditions could provide local environments where bacteria and other microorganisms could be viable. Detracting from the possibility of bacteria being present in concrete, most aerobic bacteria require a low pH environment to flourish. Also, microorganisms require a reduced from the sulfur, iron, or organic carbon as an energy source. These energy sources may be present in concrete, depending upon the materials used in batching the concrete. This would suggest that the choice of concrete constituents might play a role in providing a habitat for biological life. For example, blast furnace slag has significant quantities of reduced iron and sulfur, the later
in the form of oldhamite (CaS). The type of study degradation that could result varies but one possible example is sulfate expansion as a result of oxidizing sulfur to sulfate. Additionally, if any bacteria do become viable, the localized reduction in pH by the bacteria itself will lead to acid attack of the concrete. Likewise, if ferrous iron is oxidized to ferric iron, the ferric iron will spontaneously oxidize any reduced sulfur to sulfate, possibly leading to expansion or dissolution of the aggregate, or degradation of the concrete cement paste. As for carbon, a number of sources are possible with one strong possibility being fly ash.

2.3 Beneficial Effect of Microorganisms in Concrete

In 1999, S Bang at South Dakota School of Mines and Technology USA has invented a process, which induces bacteria to create natural, environment-friendly cement that can be used to repair faults in rock and concrete. The specialty of this research is bioremediation where using biology to fix things that are broken in the environment. It is noted that many types of bacteria are efficient at extracting the nitrogen they require to live from urea (the nitrogenous component of urine, produced by many microorganisms), and produce carbon dioxide and ammonia as byproducts. In presence of water, that ammonia will react with it to from ammonium hydroxide and if calcium is also present, that ammonium hydroxide will react with calcium it to from crystals of calcium carbonate. Calcium carbonate (CaCO₃) is better known as limestone. They also showed that this reaction occurred at higher rate than the naturally formation of CaCO₃. Two common types of soil bacteria, Bacillus pasteurii and Pseudomonas aeruginosa are used with sand. A rich solution containing both urea and calcium chloride are also added to feed the bacteria. After using up the supply of nutrients, the bacteria die, but by that time, the calcium carbonate has crystallized the pores of the matrix into solid limestone. An initial experiment were done in test tubes, and now succeeded in “growing” limestone directly within cracks in concrete blocks. This bacterial cement has many advantages over other methods of sealing faults in concrete. It is generally pollution free and environment-friendly. It integrates with the porous concrete rather than simply filling the space in the crack.
In 2001, Abad Abad H.A et.al, of national university of Colombia published a paper on the analysis of the thermal conductivity of mortars incorporated with a biological non-conventional additives. The aim of this research was to improve the quality of cement mortar using calcification type of bacteria as a biological non-conventional additive (jarosite mineral). Adolphe, J. P. from the Paris University, discovered the calcification bacteria in 1974. This bacterium was isolated from its natural habitat, which is acidic, quimiolotrotroica, gram negative, thermophylic and it does not use the krebs cycle. It was grown with its respective basal salts dissolved in water, where the population numbers were around \(1 \times 10^{12}\) cell/ml, which were monitored with a karl Zeiss microscope with a 1600 power lens and incubation period runs from 12 to 15 days with exposition to air and agitation. Improvement in compressive strength, flexural strength and pore structure of mortar were studied with different concentration of these bacteria. A 16% increment of compressive strength of mortar having 30% concentration of bacteria was reported compared to mortar with no bacteria. Flexural strength of mortar was also increased by 12% for this case. Pores diameter of mortar with 30% concentration of bacteria was reduced by 6% compared to that of mortar with no bacteria. Thermal conductivity was also measured for mortar with 0%, 30%, 60%, 100% dose of bacteria. Maximum decrement on thermal conductivity was noted for mortar 30% concentration of bacteria addition. For all concentration of bacteria addition (30, 60, 100) the thermal conductivity of mortar was reduced compared to mortar with no bacteria. However, no explanations have been provided for such decrement in thermal conductivity with the addition of calcification type of bacteria.

In 2001, Ramachandran, S.K et al. of South Dakota School of Mines and Technology USA, have presented a novel technique for remediation concrete cracks and fissures using microorganisms in their paper titled Remediation of Concrete Using Micro-Organisms. Typical common soil bacteria Bacillus pasteurii (ATCC 11859) and Pseudomonas aeruginosa (ATCC 27853) were used for the study. Initially Portland cement mortar cubes (50.8mm × 50.8mm × 50.8mm) were prepared with B. Pasteurii of concentration 0, \(3 \times 10^7\), \(6 \times 10^7\) and \(1.2 \times 10^8\) cells/cm³ in saline and phosphate buffer separately. It is noted that the compressive strength prepared in phosphate buffer is more
compare to saline- buffer at all cell concentration. Thus phosphate buffer solution was used in all the other tests. The decrease in compressive strength of the cubes containing saline may be due to the presence of chloride ions in the solution. The cubes prepared with phosphate buffer, however showed a tendency to decrease in strength slightly at higher concentration of cells. Further two sets of microorganisms were used in phosphate, one set with pure culture of *B. pasteurii* and the other with a maximum of *B. pasteurii and P. aeruginosa* in equal concentration. Both live and dead biomasses of these microorganisms were suspended in a phosphate buffer of concentration $7.6 \times 10^3$, $7.6 \times 10^5$ and $7.6 \times 10^7$ cells/cm$^3$. From the 7 days and 28 days mortar strength results, it is noted that the overall compressive strength increased in the mortar cubes that contained all forms of biomass. The 7-day compressive strength increased as the cell concentrations increased in cement cubes regardless of their forms. The 28-day strength test results of cubes with live cells showed an increase in compressive strength with the increase of cell concentrations in both forms of the *Bacillus and Pseudomonas* mixtures, whereas an opposite effect was shown in both forms of the *Bacillus*-only group. Finally, stiffness of mortar beams of dimension (25.4mm × 25.4mm × 152mm) having artificially crack of dimension 3.175mm width and varying depth of 3.175mm and 9.525 mm ($3.8 \times 10^9$ cell/cm$^3$) was filled with sand and *B. Pasteurii* was determ ine after 28 days under three point loading of span 127 mm cracks in control specimen was filled with sand and water. The result showed a significant increase in stiffness of the beam of 3.175 mm depth of cut. The presence of *B. Pasteurii* showed more effective remediation in shallower cracks than deeper cracks. On physical examination it is noted that the sand particles were held together by the precipitation of calcium carbonate. However, it is not possible to determine the quality of sand between the sand particle and the surface of the crack. Similar experiment was made on mortar cubes having artificial crack of width 3.175 mm and varying depth of 12.7 mm, 19.05 mm and 25.4mm. Control specimen was filled with natural sand and water. For the treated specimens cracks are filled with sand and *B. Pasteurii* with cell concentration $3.8 \times 10^8$ cell/cm$^3$. Cracks filled with bacteria and sand show higher values than those with sand only. As expected, the overall compressive strength of Portland cement mortar cubes decreased with the increase in the crack depth, whether microorganisms were present or not. This may due to more active growth of
microorganisms in presence of oxygen at shallower depth. The increase in strength and stiffness of mortar beams and mortar cubes are increased due to calcite precipitation during microbial growth as confirmed by Scanning Electron Microscope (SEM) examination.

**Vemuri Latha Swarna et.al,** at South Dakota School of Mines and Technology, USA have studied the effect of induced microbial precipitation reducing the plastic shrinkage crack of concrete slab by external remediation in 2004. Concrete slab of dimension 30.8mm x 30.8mm x 25.4mm was cast with and without microorganisms to determine the plastic shrinkage after 24 hour of casting. Plastic shrinkage crack has been expressed as a length of the crack multiplied by average crack width to determine the total crack area of the given slab. External remediation has been done for slab made without bacteria in different cell concentration of $10^6$, $10^8$ cell/ml and media, some slab are also treated with only medium and only with water. It is found that the plastic shrinkage slab in concrete has been reduced substantially after treated with live bacteria. Higher concentration of bacteria has a greater efficiency in remediation the plastic shrinkage crack. In case of remediation without bacteria some reduction in crack area about 8% was noticed. This may be due to the fact that medium alone would have reacted with calcium ion present in the cement paste resulting in the precipitation of calcite crystals. However crack slab remediate with water at no reduction in plastic shrinkage crack area. It was concluded that bioremediation has greater efficiency in remediation of plastic shrinkage crack than chemical remediation, it is also noted that the influence of slab position has a great of plastic shrinkage crack reduction capacity of slab. Two crack slab are remediate in the tank having bacterial concentration of $1 \times 10^6$ cell/ml placing one over another separated by glass tube. It is found that higher reduction in creak area of slab placed at the bottom of the remediation tank compared to the slab at the slab at the top of the remediation tank. Probable reason would be that bacteria tend to settle down at the bottom of the remediation tank. Effect biochemical remediation of slab made with bacteria has also been studied. Initially slabs are made with concrete and bacteria suspended buffer solution and tested for plastic shrinkage crack potential. The crack slabs are than kept in two different remediation tanks one for chemical remediation and
medium and other for bioremediation with live bacteria with concentration $1 \times 10^8$ cells/ml. It is found that slab made with bacteria subjected to bioremediation has a greater reduction in plastic crack area than subjected to chemical remediation, this process that bacteria play an important role in microbiologically induced chemical precipitation. It can be also inferred that slab made with bacteria has greater plastic crack area remediation capacity when subjected to bioremediation than slab made with out bacteria. Further effect of dead and live bacteria on plastic shrinkage crack area reduction capacity of control concrete slab has been studied. It was found that live bacteria had greater efficiency in remediation of the plastic shrinkage crack than killed bacteria. Crack slab remediate with killed bacteria had only 10% reduction in crack area. This may be due to the fact that the medium alone would have reacted with the calcium ion presented in the cement paste resulting in the precipitation of calcite crystal. X-ray Diffraction (XRD) technique was used to characterize the chemical composition of the crystal due to the bioremediation, which are effected in plugging the crack. Scanning Electron Micrograph (SEM) was also used to conduct the simultaneous morphological and chemical characterization of the specimen. The micrograph clearly shows the perfect calcite crystal on the surface of the external remediation crack sample.

A study on the development biological cement or bio-cement at Murdoch University, Perth Australia had been made by Whiffin V. It was claimed that the developed material holds great promise and may be possible for carrying out site repairs on porous building materials as sandstone efficiently. The experiment includes the capability of the bacteria genera Bacillus and proteus to produce an enzyme that in the presence of the right substrate forms carbonate ions. When calcium ions are present in this reaction, calcite crystals, such as those that make up limestone are formed. In a porous material such as limestone or sandstone, the calcite crystals link the materials individual grains, thereby imparting strength. In looser particles (sand), formed the process conform a solid block of material. Natural sandstones take five hundred to a thousand million years to form whereas it is possible to make something that is essential the same as natural sandstone in a few days. The components of the bio-cement are aqueous and thus can be applied by irrigating or flooding the desired material to be
strengthened. As the treated material remains porous after treatment, additional treatment can be applied to increase strength. This technology can be applied to any material that is porous. Materials with significant clay content do not bend themselves to the process because their hydrophobic properties make them difficult to penetrate. The development of bio-cement offers a number of advantages of traditional repair methods using injectable grouts or patching structural weaknesses with cement. If these materials are patched with concrete, which has lower porosity, moisture cannot move through the patched area as quickly as it moves through the existing sandstone. Consequently, moisture builds up behind the patch and causes it to detach from the structure. The big advantage of this technology is that it can infiltrate the components into the material, which results in deeper penetration and a more homogeneous end product. The bio-cement is ideal for restoring monuments and buildings of historical importance because many of these structures are constructed of sandstone and limestone. It has been reported that some overseas companies are testing the use of bio-cement in the bioremediation of waste such as disposing of strontium produced by nuclear power plants. The bio-cement is being sprayed into the waste to bind it and prevent it spreading into groundwater. However, details of results are not available.

**Bang S. S. and Ramakrishnan V.** at South Dakota School of Mines and Technology, USA has been reported microbiologically—Enhance Crack Remediation (MECR) initiation and its evaluation. *Bacillus pasteurii* was used to induce CaCO₃ precipitation as the microbial urease and hydrolyzes urea to produce ammonia and carbon dioxide. The ammonia released in the surrounding subsequently increases pH, leading to accumulation of insoluble CaCO₃. Scanning electron micrograph (SEM) and X-ray Diffraction (XRD) analyses evidenced the direct involvement of microorganisms in CaCO₃ precipitation. The micrograph shows distinct calcite crystals embedded with microorganisms found between and on the surface of sand grains. Rod-shaped bacteria were prominent in all sediment samples and appeared fossilized as calcite associated with bacteria suggests that bacteria served as nucleation sites during the mineralization process.
Figure-2.1: Scanning Electron Micrographs of microbiologically-induced calcite precipitation. (a). Calcite crystals have formed over the sand particles. Bar, 200 µm. (b). Details of crystals formation shown in (a). At this magnification the fine structure of the crystallites is easily discerned and evident. Bar, 20 µm. (c). Magnification of the area marked with an arrow in b and shown *B. pasteurii* embedded in the crystals. Bar 10µm.

It has been observed that microbiologically induced calcite remains intact in PU matrix mainly because of high pH of concrete where solubility of CaCO₃ is extremely low. The positive potential of MECR shows an interesting concrete of the crack remediation techniques in various applications. However detail investigation of biochemical studies of such process of crack remediation are under investigation.

I.V. Ramana Reddy et.al. 32, 2006 shows the effect of algae-mixed water on the initial and final setting times of cement and compressive strength development of cement mortars was investigated under laboratory conditions. The presence of algae accelerates the initial and final setting times at all concentrations, the maximum acceleration occurring at 1460 cells/ml concentration. The presence of algae increased the compressive strength of mortar at early ages, mainly at 3-days and 7-days. However, at higher ages, the trend reversed. The compressive strength decreased continuously for all concentrations in all samples from 14th day onwards. The percentage of decrease in strength continued with age at all concentrations. X-ray Diffraction (XRD) studies indicated the formation of hydroxides of calcium and aluminum compounds during hydration. Extreme caution is needed in using algae contaminated water in concrete construction.
2.4 Research Significance

The significance of this research is to identify the favorable microorganism to improve the overall behavior of cement mortar/concrete. A facultative anaerobic iron reducing bacteria collected from the hot spring at Bakreshwar, West Bengal, India has been identified for this purpose. As no similar work has been carried out in India and abroad presently, an experimental program has been taken up to study the improvement in the properties of cement-mortar/concrete using this favorable microorganism. Different cell concentrations of the microorganism along with the media were incorporated both in mortar and concrete to study the effect of amount of microorganism on strength of mortar/concrete. The effect of addition of media needed for the growth of microorganism in mortar was also studied. This microorganism is thermophilic thus it grows well in high temperature range about 50-65°C and it remains alive within the concrete till the growth media is available. This microorganism has no harmful effect in human body and easily available. *Escherichia coli* (*E.coli*) microorganism is well-characterized microorganism and also thus incorporated in the present study for comparison.

This study indicated an improvement in both compressive strength and tensile strength of mortar/concrete mainly due to the modification of pore structure with the development of special fillers. Scanning Electron Microscope (SEM) analysis, X-ray Diffraction analysis and Image analysis has been made to identify the development of such growth or fillers. Mercury Porosimetry tests were also made to determine the modification in pore size distribution due to the addition of microorganisms. Finally, Ultrasonic Pulse Velocity and Water Absorption test has been made to confirm the role of microorganism in mortar and concrete and to have a preliminary idea on durability behavior of mortar/concrete with/without microorganisms. The study provides an alternative basis for strength and durability improvement of mortar/concrete and will provide as high quality repairing material that is cost effective and environmentally safe.