it's Magic Self Healing
Agent For Concrete Mixtures

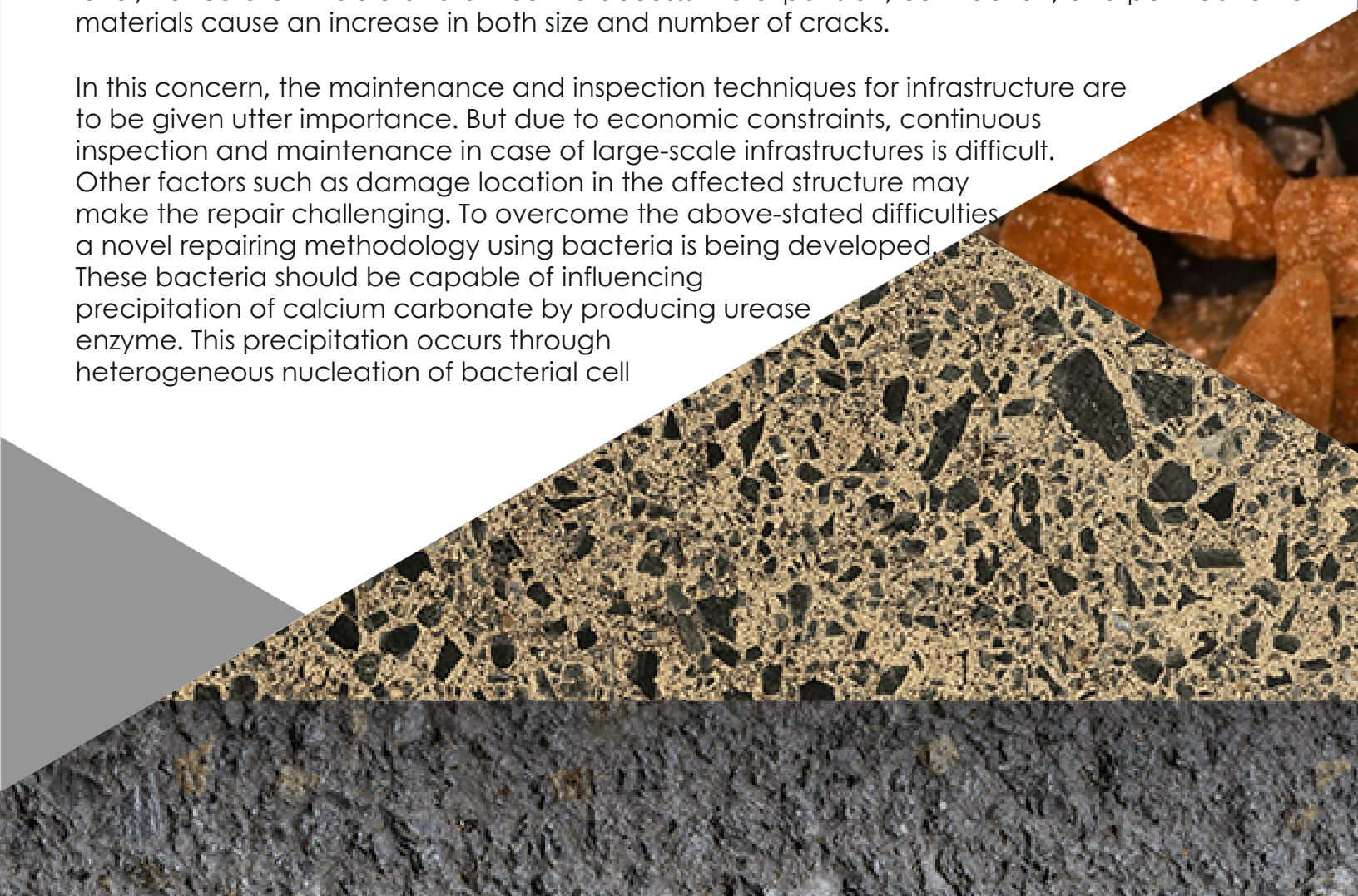
BACTAHEAL-PR

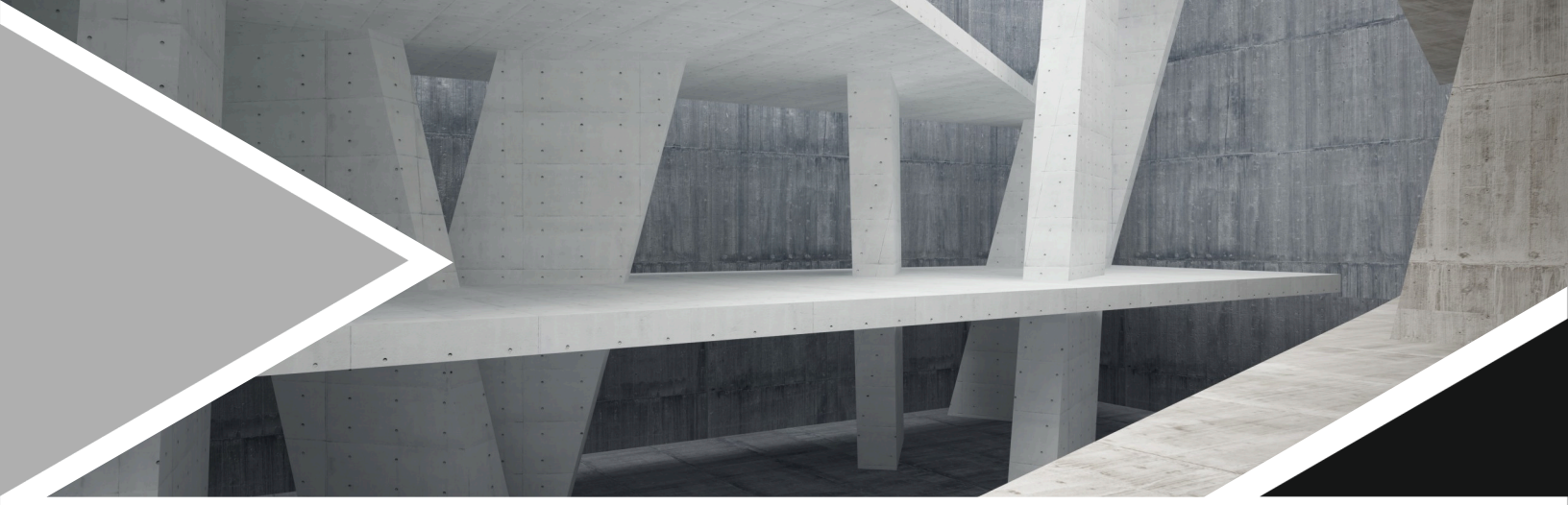
www.prionsbiotech.com

Prions Biotech offers enzyme blend BACTAHEAL-PR. The BACTAHEAL-PR is a new concept in the cement industry. Cracks in concrete are a common phenomenon due to the relatively low tensile strength. Durability of concrete is impaired by these cracks since they provide an easy path for the transportation of liquids and gasses that potentially contain harmful substances. If micro-cracks grow and reach the reinforcement, not only the concrete itself may be attacked, but also the reinforcement will be corroded. Therefore, it is important to control the crack width and to heal the cracks as soon as possible. Since the costs involved for maintenance and repair of concrete structures are usually high, this research focuses on the development of self-healing concrete. Self-healing of cracks in concrete would contribute to a longer service life of concrete structures and would make the material not only more durable but also more sustainable.
Self-healing concrete could solve the problem of concrete structures deteriorating well before the end of their service life. Concrete is still one of the main materials used in the construction industry, from the foundation of buildings to the structure of bridges and underground parking lots. Traditional concrete has a flaw, it tends to crack when subjected to tension

One of the most extensively used construction material is concrete. Due to the availability of raw materials, compressive strength, durability, and affordability. However, a lot of concrete structures certainly suffer deterioration and degradation in due course of time. This is due to penetration of water into the concrete which has an adverse effect on the efficiency of the concrete. One of such causes for deteriorations due to the formation of cracks at macro and micro levels which create the path for water ingress, dissolved particles in fluid sand unwanted acidic gasses. As a result, unwanted materials and other substances penetrate into the concrete, thus affecting the reinforcement and durability. Few cracks formed will be at micro level, hence are invisible and difficult to access. The expansion, contraction, and permeation of materials cause an increase in both size and number of cracks.

In this concern, the maintenance and inspection techniques for infrastructure are to be given utter importance. But due to economic constraints, continuous inspection and maintenance in case of large-scale infrastructures is difficult. Other factors such as damage location in the affected structure may make the repair challenging. To overcome the above-stated difficulties, a novel repairing methodology using bacteria is being developed. These bacteria should be capable of influencing precipitation of calcium carbonate by producing urease enzyme. This precipitation occurs through heterogeneous nucleation of bacterial cell





wall until supersaturation is achieved, the potential of bacteria when acting as a self-healing agent was studied in Ref and was proved to be effective.

Crack occurrence in reinforced concrete should be minimized for both durability and economical reasons as crack repair is costly. Autogenous repair, or self-healing, of concrete would save a substantial amount of money, as manual inspection and crack repair could be minimized.

Thus, a reliable self-healing mechanism for concrete would not only result in more durable structures, but would also be beneficial for the global economy. This study exploited the potential to apply calcite-precipitating bacteria as a crack healing agent in concrete.

The potential of different species to precipitate calcite, produce endospores, survive concrete-production, and heal cracks by sealing them with calcite was investigated. Furthermore, the mechanical properties of 'bacterial concrete' were tested. ESEM studies showed that alkali-resistant spore-forming bacteria embedded in the concrete matrix can precipitate substantial amounts of calcite. The bacterial approach thus seems a highly promising mechanism to mediate self-healing in concrete structures.

Cracks can occur in concrete structures due to multiple reasons such as autogenous shrinkage, freeze thaw reactions, mechanical compressive- and tensile forces. Although micro-cracks do not necessarily result in significant strength loss of concrete, the ingress of water and other reactive chemicals such as chloride and water may pose a thread to the steel reinforcement as these strongly enhance its corrosion rate.

Thus for durability reasons and potential repair costs, crack occurrence should be minimized or, alternatively, occurring cracks should ideally be healed directly after formation by an autonomous repair mechanism.

Different autonomous repair systems are feasible. One such a self-healing mechanism could involve secondary hydration reactions of still present but not fully reacted cement particles. Although a high percentage of non-reacted cement particles within its matrix may result in a concrete with a substantial self-healing capacity, the material characteristics of the initial concrete structure may not be satisfactorily as it may be more brittle and initially weaker as wanted.

Another self-healing mechanism could be based on the addition of a self healing agent that would make up a part of the concrete matrix without or insignificantly affecting its structural and mechanical characteristics.

BACTAHEAL-PR is concrete self healing agent. While ordinary concrete can handle substantial compressive loads, tensile and flexural load carrying capacity is however limited. Even when reinforced with steel rebars, concrete is sensitive to crack formation. Cracking can result in a number of problems such as water leakage, frost damage and reinforcement corrosion.

These detrimental phenomena shorten the functional service lifetime of concrete constructions substantially and require therefore costly maintenance and repair actions. For difficult to reach constructions manual inspection and repair is however often not possible or otherwise even more expensive.

A solution to avoid costly maintenance and repair actions is provided by self-healing concrete. From now on concrete is able to self-repair cracks, making constructions more durable thereby increasing its service lifetime while reducing maintenance and repair costs. BACTAHEAL-PR Self Healing Concrete is a true innovation.

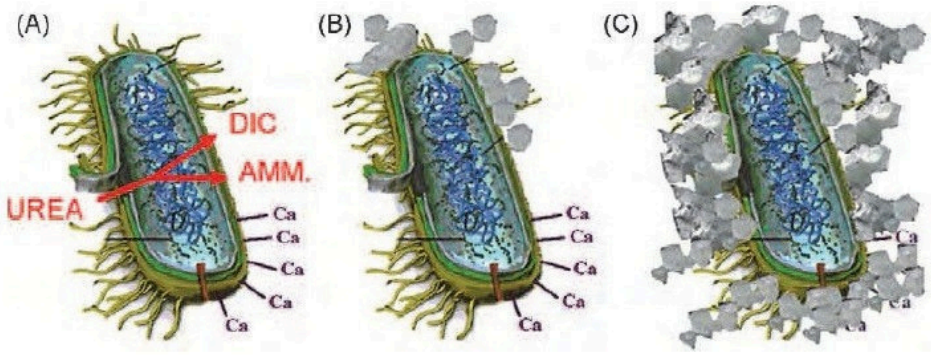
In short, BACTAHEAL-PR Self Healing Concrete will make constructions last longer, while at the same time reducing costly maintenance and repair. The choice for owners who consider construction life cycle costs.

CHARECTERISTICS: BactaHeal-PR Healing Agent is applied in special repair mortars and concrete mixtures. It is composed of a biodegradable granular additive (healing agent) what autonomously seals as water proofs up to 1-mm wide occurring cracks. Permanent sealing occurs due to concrete compatible limestone formation. Compatible with commercial concrete mixtures. Contains a biodegradable polymeric mineral precursor compound and a bio-based enzymatic catalyst (Multi enzymes + Nutrient supplements +Spore forming Bacilli)

CONTENTS

- Sporosarcina pasteurii.
- Bacillus sphaericus.
- Escherichia coli.
- Bacillus subtilis.
- Bacillus cohnii.
- Bacillus balodurans.
- Bacillus pseudofirmus.

MODE OF ACTION:



Calcium carbonate precipitation at cell wall. (a) Illustrates consumption of the CO_3^{2-} source by the bacterium, and secretion of dissolved inorganic carbon and ammonia into the extracellular space; (b) Ca^{2+} ions in the microenvironment of the bacterium; © Ca2 + ions react with CO23− ions to form calcium carbonate crystals

Concrete has an autogenous healing capacity as unhydrated cement is present in the matrix. When water contacts the unhydrated cement, further hydration occurs. Furthermore, dissolved CO2 reacts with Ca2+ to form CaCO3 crystals.

TYPICAL APPLICATION

Tunnel elements | Liquid-containing reservoirs | Basement walls
Subsurface constructions | Marine constructions | Bridge- and parking decks
Flooring systems | Tailor made solutions

One of our Prions Bactaheal-PR specialist will support your company to design your concrete self healing mix. It is tailor made special for your project. In general between 100g BACTAHEAL-PR healing agent per m3 concrete mix/ MT cement is required, depending on environmental conditions.

Prions, BactaHeal-PR can be applied in ready mixes, prefab applications, or added directly to the truck mixer on site.

Use CALCIUM LACTATE at the rate of 0.5% for the better results.

PACKING

BACTAHEAL- PR is available in standard 01 Kg Milky white standing pouch can be also custom packed upon request.

SHELF LIFE

BACTAHEAL- PR is stable under recommended storage conditions for a period of 24 months with less than 5% drop in activity.

TECHNICAL SERVICE

Any further inquiries regarding specific application, information can be obtained from our technical
services department.

Phone: 01712168556
Mail: barua.fairmate@gmail.com
Web: www.chemicalsbd.com

Reconnecting Nature

PRIONS® BIOTECH

Prions Biotech Pvt Ltd
#1300/1330E, Auto Nagar Industrial Area, (KIADB)
Belagavi-590016 KARNATAKA-(INDIA)
M : +918884444692 / 8884444655 E-mail : info@prionsbiotech.com Web : www.prionsbiotech.com

Bangladesh Chapter contact details:
Phone: 01712168556
Mail: barua.fairmate@gmail.com
Web: www.chemicalsbd.com