



KRYSTALINE C-S-H ADMIXTURES

The next generation of durable and sustainable C-S-H crystalline waterproofing admixtures.

Hydration enhancing, hydrophilic, integral C-S-H technology for waterproofing, corrosion protection, pore sealing and crack healing.

WATERPROOFING THE WORLD





“Krystaline believes in providing solutions. Our technology, our product line and our staff are focused on **resolving difficult concrete waterproofing problems** by providing our clients with a **superior product, technical support, and an opportunity to build their revenues** and their reputation through the combination of price, quality, and technical support.”

ABOUT US. WHAT DO WE DO?

Krystaline Technology S.A., is the **developer and manufacturer of the newest generation of hydrophilic C-S-H hydration enhancing admixture technologies**, Krystaline offers sustainable, durable and competitive solutions that go beyond expectations. Krystaline’s success is notably demonstrated by its strong international presence with distribution in more than **50 countries**. Krystaline has consistently proven to provide the best cost to quality ratio in the concrete waterproofing industry. Krystaline has proven that there are **sustainable and durable waterproofing and corrosion prevention solutions for concrete even in the most demanding conditions**.



WHAT ARE KRYSTALINE C-S-H TECHNOLOGY WATERPROOFING ADMIXTURES?

Krystaline C-S-H technology waterproofing admixtures are the **newest generation of crystalline technology**. When added to concrete they **enhance the hydration of calcium silicate hydrate amorphous gels and crystals** to permanently **reduce the size and volume of pore** and capillary network within the concrete micropore structure. In the presence of water, the enhanced hydration abilities will continue to reduce the pore and capillary passages until the ingress of water has stopped, even years later.




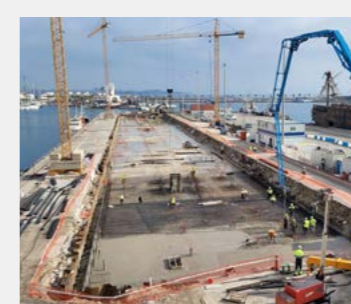

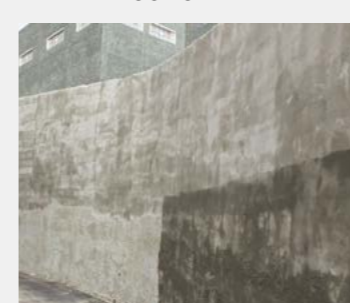

HOW IS C-S-H TECHNOLOGY DIFFERENT?

C-S-H technology, in the presence of water, **increases and expands the non-soluble calcium silicate hydrate gels/crystals that make up the pores and capillary network to effectively reduce the actual pore size and stop the water ingress**. C-S-H technology admixtures do not use chemically reactive pore blocking technology to densify the concrete or rely on filling the pores with needle like calcium hydroxide crystals. It does not react with the free lime to create calcium hydroxide inside the pores.

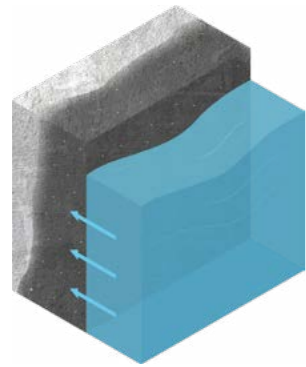
It is the next step in crystalline evolution!



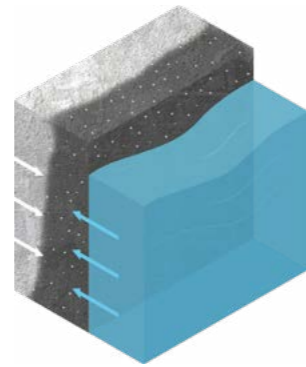
WHERE CAN C-S-H TECHNOLOGY BE USED?

| | | |
|---|--|--|
| <p>PRECAST CONCRETE</p>  | <p>PLACED CONCRETE</p>  | <p>JOINT DESIGN / REPAIR SOLUTIONS</p>  |
| <p>APPLIED TO EXISTING CONCRETE</p>  | <p>SHOTCRETE</p>  | <p>Krystaline Offers a Full Range of C-S-H Technology Solutions Providing Project Durability and Sustainability.</p> |

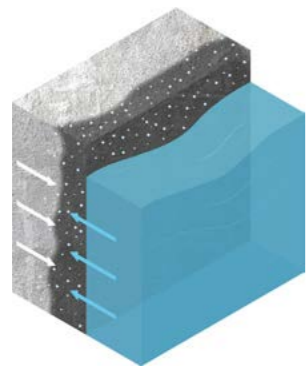
HOW DO KRYSTALINE ADMIXTURES WORK?



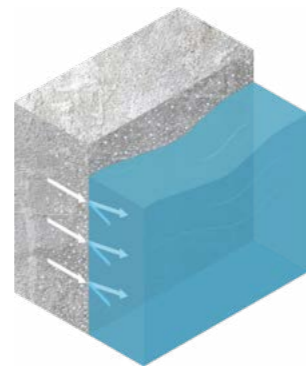
When the concrete is placed, initially water will enter the concrete.



C-S-H technology begins the process of generating and expanding the amorphous C-S-H gels in the micropores structure.



As the gels continue to develop and expand, the pores and capillaries become continually less permeable.



The process continues until the water has been stopped. Should water enter in the future, the process will reactivate.

KRYSTALINE C-S-H ADMIXTURES SOLUTIONS

- Krystaline admixtures use unique C-S-H technology to improve the short term and long-term hydration process creating watertight concrete through the enhanced development of non-soluble calcium silicate hydrate binders in the concrete!
- Krystaline admixtures will continuously improve over time in the presence of water, even years later.
- Krystaline admixtures will increase the mechanical and physical properties of the concrete.
- Krystaline Admixtures have been certified and thoroughly tested in a variety of environments.
- Krystaline admixtures are used as standalone waterproofing systems allowing the elimination of waterproofing membranes and coatings.

WHERE TO USE KRYSTALINE C-S-H ADMIXTURES?

Krystaline C-S-H admixtures are used primarily to keep water in or keep water out.



From below grade structures to underwater pours, from water towers to wastewater treatment plants, from rainforest conditions to desert conditions Krystaline C-S-H has already been tried, tested and proven true!

HOW DOES KRYSTALINE C-S-H TECHNOLOGY WORK?

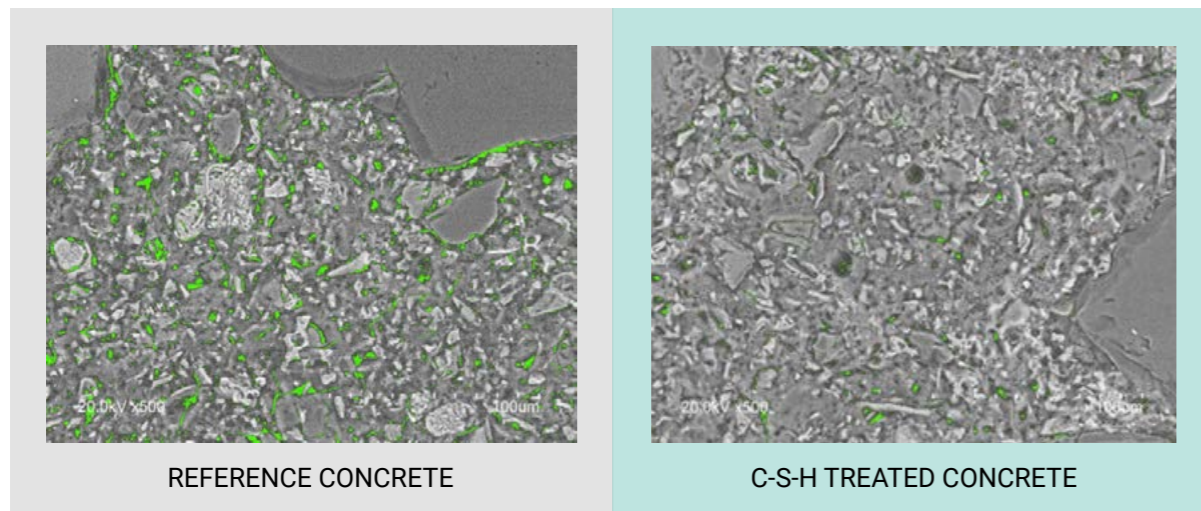
Krystaline's C-S-H hydration enhancing technology creates watertight concrete and increases the physical and mechanical properties of the concrete through what can best be defined as improved hydration abilities.

The improved hydration enhances and increases the generation of Calcium Silicate Hydrate (C-S-H) amorphous gels in the concrete while lowering the Ca(OH)_2 hydration to create a tighter micropore structure within the concrete matrix reducing the total pore volume and the average pore diameter both in the short term and in the long term.



If it does not increase C-S-H content while lowering Ca(OH)_2 content it is not C-S-H Technology!

WHAT HAPPENS INSIDE THE CONCRETE?



The SEM photos above show the difference between Reference Concrete (left) and C-S-H treated concrete (right). The C-S-H treated concrete resulted in a significant reduction in voids within the concrete micropore structure.

THE C-S-H TREATED CONCRETE ABOVE HAS

Reduced Specific Pore Surface Area By

20.8%

Reduced Total Pore Volume By

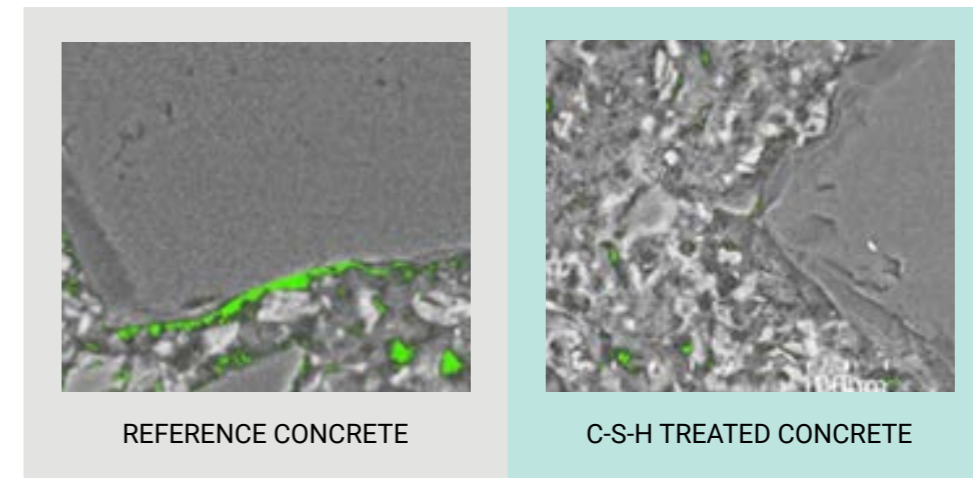
44%

Reduced Average Pore Diameter Size By

33%

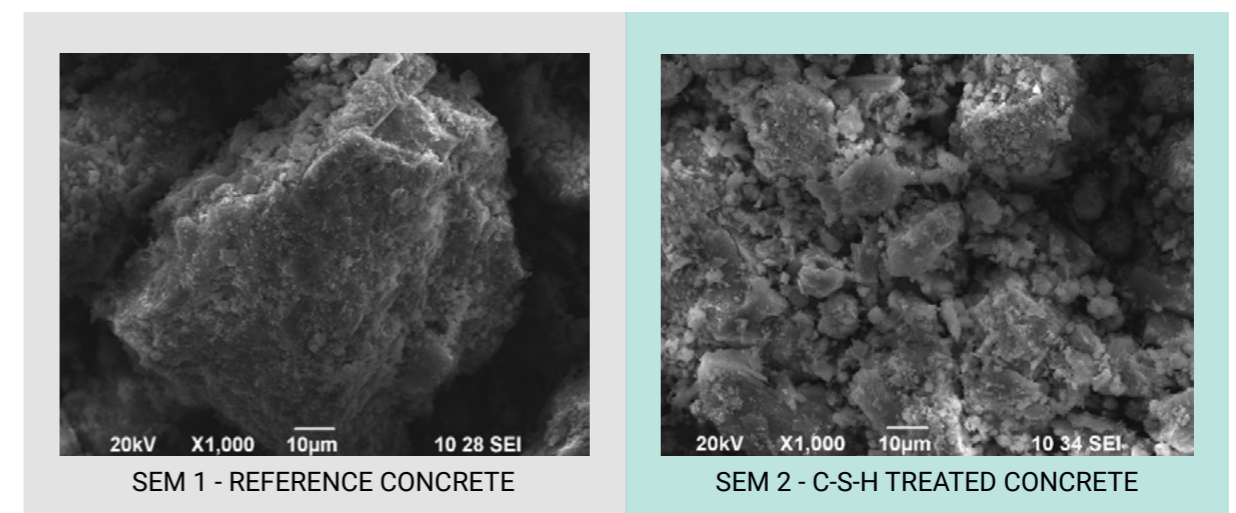
C-S-H technology in the concrete improves bonding in the interface between aggregates and cement paste (interfacial-transition zone) by improving hydration and increasing CSH gels in these critical areas, resulting in higher compressive strengths, improved tensile strength, and improved flexural strengths, while further reducing the permeability of the concrete. Microcracks are also reduced since they often initiate and propagate preferentially in the interfacial zones.

Krystaline C-S-H treated concrete provides permanent permeability reductions to concrete and increased compressive strength!

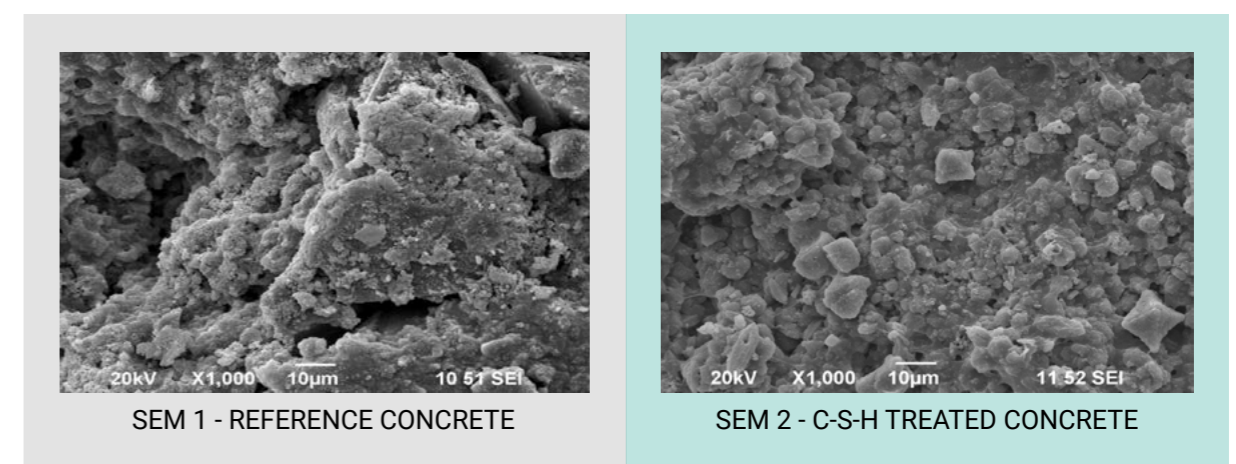


WHAT HAPPENS TO THE MICROPORE STRUCTURE IN THE LONG-TERM?

SEM 1 & 2 TAKEN AT 28 DAYS



SEM 3 & 4 SAME SAMPLE BUT TAKEN AT 2 YEARS



After two years, the C-S-H technology has continued to enhance hydration more effectively.

Krystaline C-S-H technology over time will continue to develop and enhance CSH gels to effectively stop water ingress. Unlike other technologies, C-S-H hydration technology will keep improving especially in demanding situations.

The result is watertight concrete with the capability to self-heal.

KRYSTALINE TECHNOLOGY SELF-HEALING CRACKS

The very nature of Krystaline technology to enhance the hydration of C-S-H crystals and gels, even years after the concrete has been placed, enhances the ability to self-heal cracks in the presence of water. The admixtures amplify concrete's own natural hydration process within the pore and capillary structure enhancing the C-S-H hydration in the presence of moisture.

The enhanced hydration process provides permanent waterproofing characteristics to the concrete and augments the abilities of the concrete to self-heal micro-cracking well beyond the boundaries of normal concrete.



Laboratory test - Universidad Catholica, Santiago, Chile



Below grade - Hospital, Denia, Spain



Self healing wall - Kuwait
Below grade parking garage in Kuwait where cracking has occurred and the concrete has self-healed resulting in no repair systems necessary!

Enhancing concrete hydration enhances concrete's ability to self- heal!

KRYSTALINE'S C-S-H TECHNOLOGY ADMIXTURES HAVE BEEN CERTIFIED AND PROVEN



DITplus certified Agrément, suitability and performance certificate

Verifies compliance with harmonized technical specifications established in the Construction Products Regulation (EU) n° 305/2011: Harmonized Standard and European Technical Assessment Document (ETA).

Verifies compliance with the CTE (Código Técnico de la Edificación).

Verifies inclusion in the Harmonized European Standard UNE-EN 934-2: 2009 + A1: 2012.

Verifies self-healing of cracks at 0.5 mm.

Approved for potable water usage.

Verifies increases mechanical resistance.

No other crystalline manufacturer has this certificate/ approval.



British Board of Agrément

Certificate 19/5612

Confirms 92% reduction in permeability vs control as per test procedure VTPN950/09/106010

Confirms reduction in dry shrinkage and wetting expansion.

Confirms increased compressive and flexural strength.



EPD Verified (Environmental Product Declaration)

Environmental impacts have been assessed over the whole life cycle.

Third party cradle-to-grave analysis.

Fully compliant with EN 15804 and ISO 14025 standards.



CE Mark Certified

Conforms to EN 934-2:2009+A1:2012

Certified with ENAC Certificate of Conformity of Factory Production Control 2+

Certificate N° 1170/CPR/AT.04078



Potable Water

Approved for contact with water for human consumption, Approval N°: 2009530.

KRYSTALINE'S C-S-H TECHNOLOGY ADMIXTURES HAVE BEEN TESTED



Potable Water

Approved for Water Migration according to UNE-EN ISO 14944-3: 2008.



Potable Water

Valid BS 6920: 2014 certification issued by NSF.



Potable Water

Approved for MS1583:Part1:2003 and MS 1583:Part2:Section 1 and Section 5.



Verified Resistance To Sulphate Attack

Test according to modified US Bureau of Reclamation test USBR 4908.

PROJECTS AROUND THE WORLD

WITH C-S-H ADMIXTURES FOR WATERPROOFING (NO MEMBRANES)



MARINE STRUCTURE
SPAIN



MARINE STRUCTURE
POLAND



WASTEWATER FACILITY
ROMANIA



ARTIFICIAL LAKE
BULGARIA



BELOW GRADE
INDIA



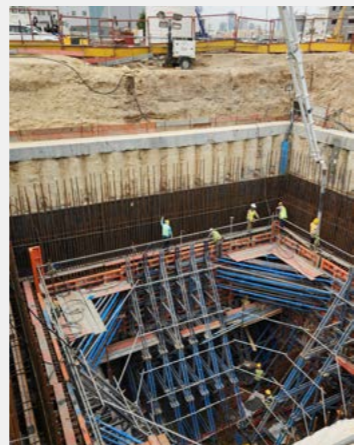
UNDERWATER POUR
SPAIN



WASTE WATER TREATMENT
MALAYSIA

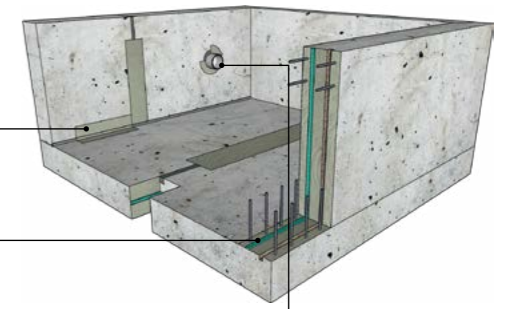


BELOW GRADE
HONG KONG



MANHOLES
KUWAIT

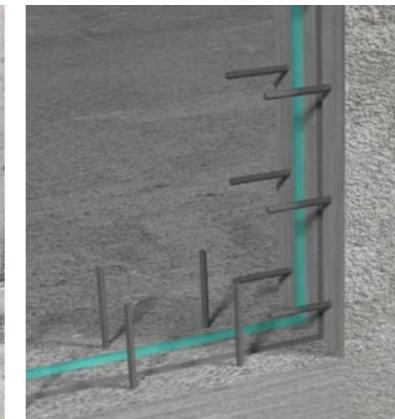
KRYSTALINE OFFERS A FULL TANKING SYSTEM



STRUCTURAL CONCRETE REPAIRS



KRYSTALINE DAY JOINT DESIGNS



TIE-HOLES AND PIPE PENETRATIONS



EFFECTIVE SOLUTIONS TO ENSURE A WATERTIGHT STRUCTURE

WATERPROOFING THE WORLD

DISCLAIMER

Whilst any information and/or specification contained herein is to the best of our knowledge, true and accurate, we always recommend that a trial be carried out to confirm suitability of the product. The information in this data sheet is effective from the date shown and supersedes all previous.

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