XYPEX® The World Standard in Concrete Waterproofing by Crystallization

NO EQUAL™

NO EQUAL™

XYPEX - THE CRYSTALLINE DIFFERENCE

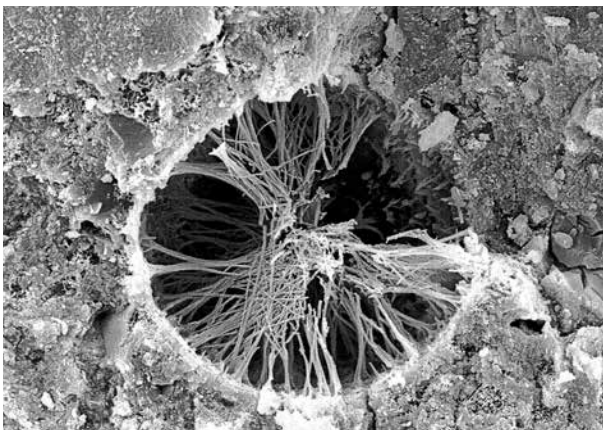
It has been over 50 years since Xypex Chemical Corporation first coined the phrase "Concrete Waterproofing by Crystallization", a statement and concept that represented a radical departure from traditional surface-reliant barrier products of the day.

Pursuing an entirely new path, Xypex developed a unique technology that takes advantage of the natural and porous characteristics of concrete. With water as the catalyst, Xypex's proprietary chemicals react with the natural by-products of cement hydration (calcium hydroxide, mineral salts, mineral oxides, and un-hydrated and partially-hydrated cement particles), forming a non-soluble crystalline structure within the interconnected pores and other voids in concrete. In this way, the crystalline structure becomes a permanent, integral part of the concrete matrix itself, preventing the ingress of water and other liquids even under strong hydrostatic pressure, and providing protection against harsh, aggressive environments.

Since the introduction of Xypex, tens of thousands of concrete structures around the world have been waterproofed and protected with this unique crystalline technology and, over the years, extensive research, testing and performance success have furthered the awareness, understanding and confidence in Xypex, earning both the technology and the company an enviable reputation as the world standard in crystalline waterproofing.

Xypex has enjoyed considerable success, so it comes as no surprise that products attempting to imitate our proprietary crystalline technology can be found in today's marketplace. Responding to the growth in permeability-reducing admixtures, the American Concrete Institute (ACI) issued a document (ACI 212-3R-16) that clarifies performance expectations by separating additives into two sub-categories: additives for concrete not subject to hydrostatic pressure; and additives for concrete that is subject to hydrostatic pressure, including crystalline technology.

In the following pages, using the high-power imaging capability of a Scanning Electron Microscope (SEM), we display visual evidence that clearly differentiates Xypex from all other products in the waterproofing admixtures category. SEM is a technique whereby a precise photographic image of a microstructure is produced by scanning it with a focused beam of electrons. Extremely high degrees of magnification can be attained and, at x500 magnification, Xypex crystalline formations at work can be seen.



XYPEX TREATED CONCRETE

The SEM images that follow show conclusively that the many and varied Xypex non- soluble crystalline structures formed within the concrete are unique, and truly have ... ***NO EQUAL***.

XYPEX®

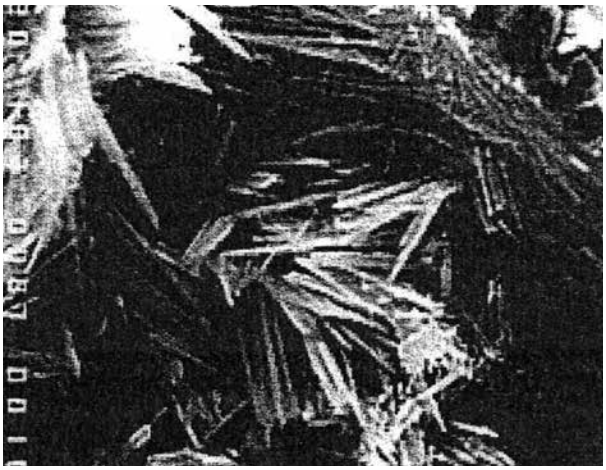
PERMEABILITY

AUSINDUSTRY START GRADUATE PROGRAM
SEM-105

As part of an extensive test program, samples were subject to water pressures equivalent to 100 m (330 ft.) of head. The 50 mm (2 in.) thick Xypex treated samples showed no signs of water penetration at this pressure, whereas the untreated control samples leaked even at 60 m (196 ft.) of water head. Below we see an SEM image of a Xypex treated sample at 2500x magnification. Note the dense mesh of Xypex crystals.

XYPEX TREATED CONCRETE

NO EQUAL™



XYPEX TREATED CONCRETE

CRACK-HEALING

CIVIL ENGINEERING SOCIETY OF JAPAN
SEM-102

The Hokutoh road-traffic bridge in Japan, constructed in 1972 suffered extensive cracking with widths of 0.1 – 0.2 mm allowing the penetration of water and de-icing salts. After treatment on the lower side of the bridge deck with Xypex Concentrate, cores were taken and subjected to 2 kg/cm^2 (29 psi) of pressurized water over time. Whereas the untreated areas continued to leak, all of the Xypex treated areas healed and leaking stopped.

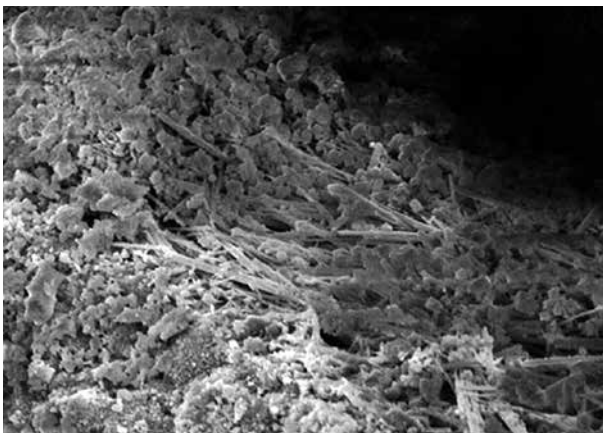
In the SEM image, taken from concrete samples at 6 – 10 cm (2 – 4 in.) beneath the Xypex coated surface of the concrete, we can see how Xypex Crystalline Technology healed the cracks and stopped the leakage.

XYPEX®

CRACK-HEALING

STREC – CHULALONGKORN UNIVERSITY THAILAND SEM-112

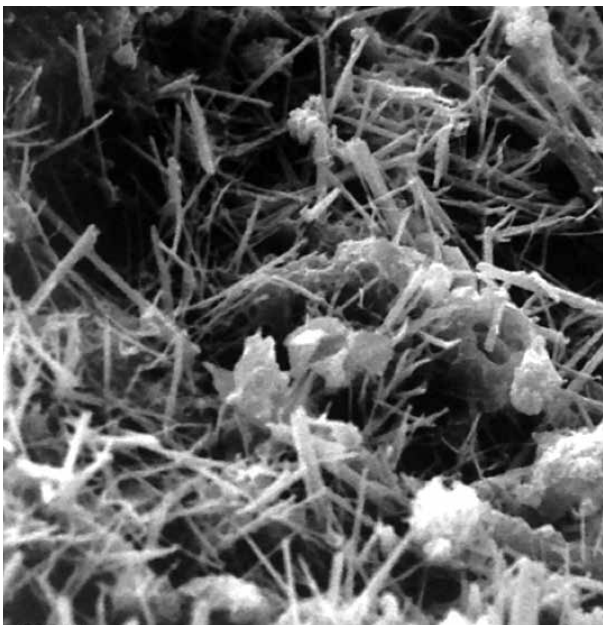
Experts investigated Xypex's crack-healing ability for cracks wider than 0.4 mm. In a sample taken from an in-service pre-cast element, the crack measured from 1.0 – 1.5 mm. From the x1000 imagery, taken at 28 days, it is evident that even in wider cracks Xypex crystals are forming.



XYPEX TREATED CONCRETE

XAYABURI HYDROELECTRIC POWER PLANT, LAOS SEM-114

As part of the approval process, Xypex treated concrete was subjected to crack-healing testing. Concrete panels were cast, cracked by force and subjected to ponding of water over the cracks to measure the flow. The untreated control samples had cracks with an average width of 0.23 mm and continued to leak beyond the 25 day limit for the test. The Xypex treated panel had cracks with an average width of 0.38 mm and leakage through the cracks stopped after just four days. This was a site demonstration of the crack-healing abilities of Xypex and was subsequently captured in this SEM image.



XYPEX TREATED CONCRETE

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In many repair situations it is impractical or too expensive to repair defective concrete on the positive side that is directly in contact with water.

Here, a sample of concrete coated with Xypex Concentrate on the negative side was left exposed to the environment for 12 months. SEM images were then taken of samples at different depths from the surface of the concrete. We can see evidence of crystalline growth at 300 mm (12 in.) from the surface of the concrete.

NEGATIVE-SIDE WATERPROOFING

CIVIL ENGINEERING SOCIETY OF JAPAN
SEM-100

XYPEX TREATED CONCRETE

SUPPLEMENTARY CEMENTITIOUS MATERIALS (SCMs)

UNIVERSITY OF NEW SOUTH WALES
SEM-105

In this study, investigators wanted to understand how Xypex Admix reacts with supplementary cementitious materials (SCMs) such as blast furnace slag and fly ash. In this first image, taken at x2000 magnification, we can clearly see the Xypex Crystalline formation in a highly dense, 50 MPa (7,250 psi) compressive strength concrete containing a 60% slag blended cement.

In this next image, again at x2000 magnification, we can see the Xypex Crystalline formation in a 65 MPa (9,425 psi) compressive strength concrete containing a 30% fly ash blended cement.

XYPEX TREATED CONCRETE
(60% SLAG BLENDED CEMENT)

XYPEX TREATED CONCRETE
(30% FLY ASH BLENDED CEMENT)

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The essence of concrete durability is to protect the reinforcing steel of concrete from corrosion. Xypex achieves this by preventing the ingress of water and harmful chemicals. To assess the impact of Xypex on durability, investigators compared an untreated sample of concrete and a sample coated with Xypex Concentrate at a depth of 50 mm (2 in.), representing the standard cover depth of concrete over reinforcing steel.

In the untreated image we can see precipitated calcium hydroxide particles and no crystalline growth. In the sample treated with Xypex Concentrate, we can see that at 50 mm (2 in.), an extensive crystalline formation has taken place, affording complete protection for the embedded reinforcing steel.

CONCRETE DURABILITY

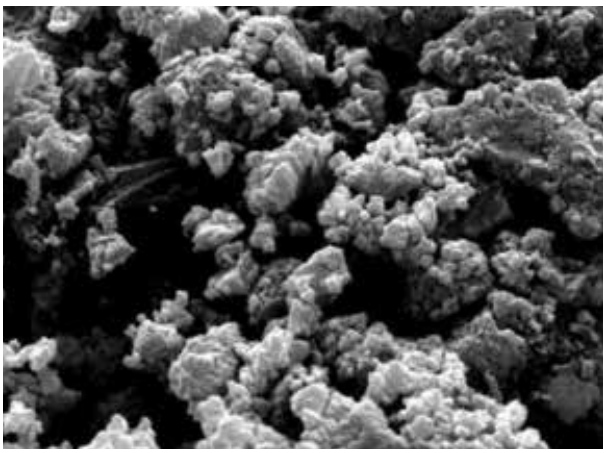
NIKKI SHOJI CENTRAL RESEARCH LABORATORY
SEM-101

UNTREATED CONCRETE AT 50 MM

XYPEX CONCENTRATE AT 50 MM

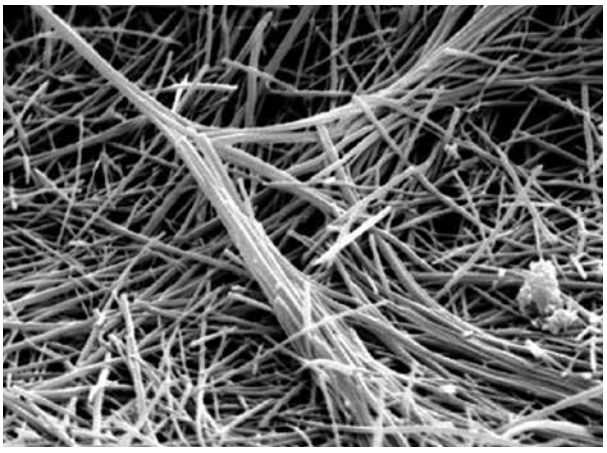
PERFORMING IN SITE CONDITIONS

JINGHONG HYDROELECTRIC POWER STATION,
LANCANG RIVER, YUNNAN PROVINCE, CHINA
SEM-110



UNTREATED CONCRETE

Xypex was chosen to protect and waterproof the 1.5 m (5 ft.) thick upstream face of this 108 m (354 ft.) high, 704.5 m (2,311 ft.) wide, gravity dam constructed with roller-compacted concrete. Prior to selection, concrete samples were produced on site using exactly the same materials used in the production of the construction concrete. They were then subjected to rigorous testing, at all times comparing the performance of untreated samples with those treated with Xypex.



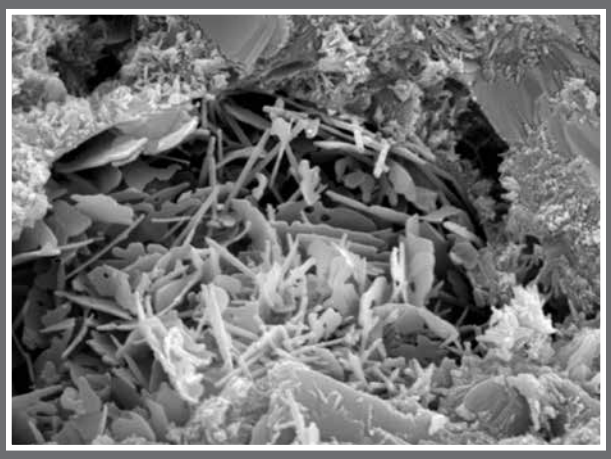
XYPEX TREATED CONCRETE

The SEM investigation of the same samples clearly illustrated the dense, crystalline structures formed within the Xypex treated concrete matrix, giving 100% protection to the face of the dam.

XYPEX®

PROTECTION AGAINST CHLORIDE ATTACK

ELECTRICITY GENERATING AUTHORITY
OF THAILAND, RATCHABURI POWER STATION
SEM-113



XYPEX TREATED CONCRETE

The Ratchaburi Power Station is located on the estuary of the Mae Klong River and is exposed to destructive chloride attack. Xypex Concentrate and Modified were used to treat the 4-year-old roof decks of the cooling towers. Concrete cores extracted from the cooling towers were subjected to microscopic examination. In the SEM image taken at x7000 magnification and a depth of 20 mm, we see the developing crystalline formation inter-woven with flat plate-like structures similar to calcium hydroxide. This formation protects the reinforcing steel from harmful effects of chloride attack.

XYPEX TREATED CONCRETE

PROTECTION AGAINST CHEMICAL ATTACK

JINGHONG HYDROPOWER STATION
YUNNAN PROVINCE CHINA
SEM-115

In this image we can see the diverse mesh of the non-soluble crystalline structure that forms deep within the pores and capillary tracks of the concrete mass. Not only will the crystalline technology prevent the ingress of water into the concrete but will also protect the concrete from chemical attack. Whether from chlorides, sulfates, acids, hydrocarbons or industrial chemicals, Xypex will provide protection within a pH range of 3-11. Xypex has been proven both in independent laboratory tests and actual projects to extend the service life of concrete far beyond planned expectations.

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XYPEX®

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