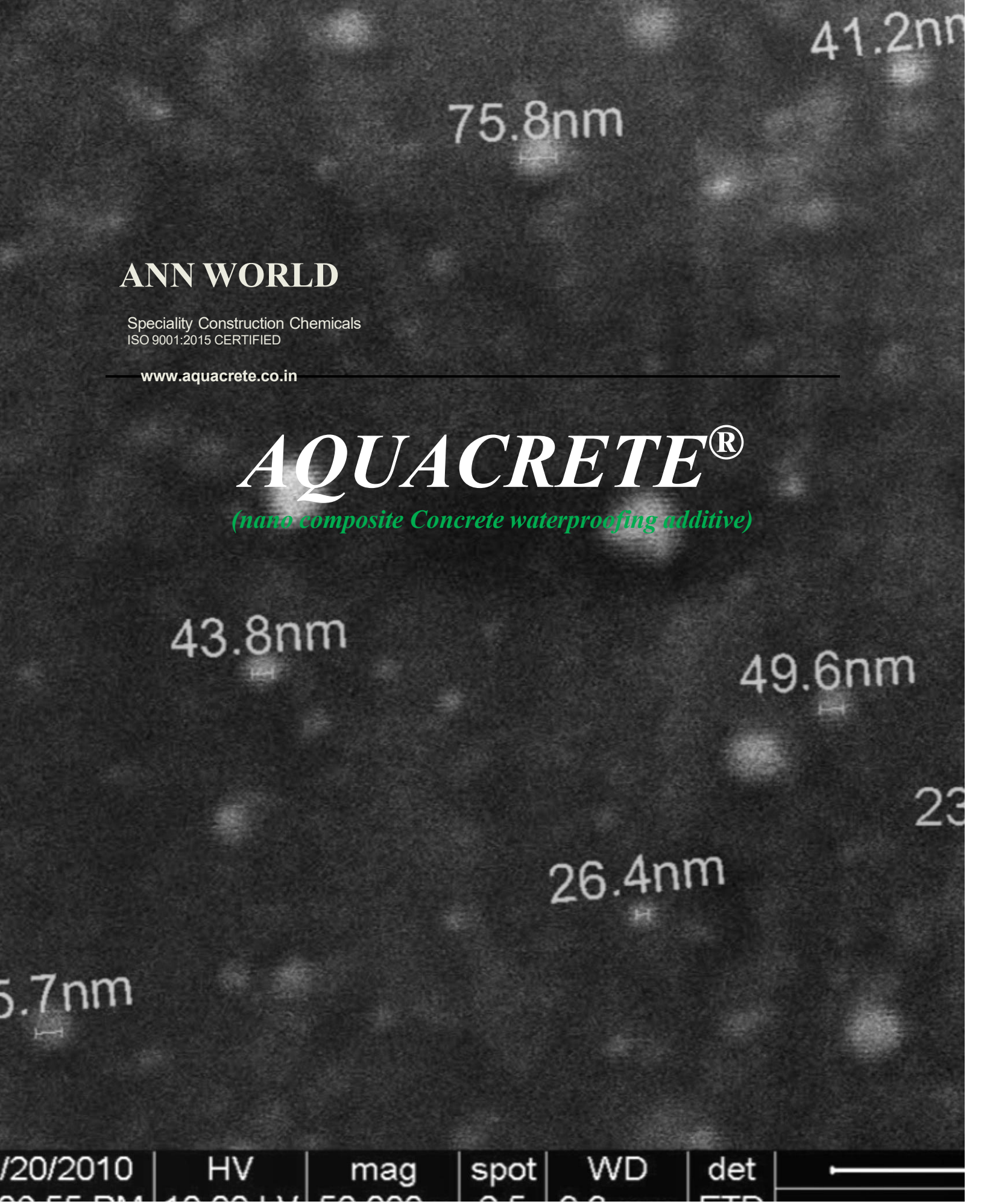


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Speciality Construction Chemicals
ISO 9001:2015 CERTIFIED

www.aquacrete.co.in

AQUACRETE®

(nano composite Concrete waterproofing additive)

AQUACRETE®

NANOCOMPOSITE FOR CONCRETE WATERPROOFING

Concrete and other cementitious surface is porous. The pore size lies between nano to micro range (10 nano to 50 micrometers). Water and soluble contaminants penetrate through the pores of the structure and causes gradual degradation of the concrete.
The degradation appears in the form of efflorescence, laitance, spalling concrete and cracks. These facilitate active ingression of water with various ion contaminants transported from higher concentration to lower concentration within the inner pores of the concrete. This ingression can be avoided blocking the pores of concrete.

AQUACRETE® produces the crystal on hydration reacting with un-hydrated free calcium oxide present in the cement, which blocks the pores and makes concrete stronger, impermeable and durable.

Reaction and its result

Four phase cement reaction-

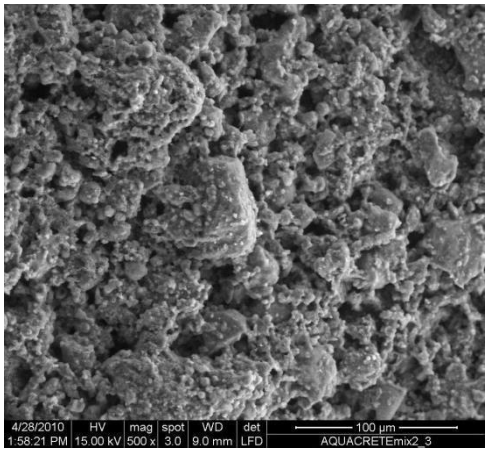
1) **Unreacted cement.**
2) **Surface products like C-S-H grows outward with connected gel pores.**
3) **Pore products as calcium hydroxide is polycrystalline and fully dense with no connected pores.**
4) **Capillary pores- the water filled space between the solid phases.**

. As soon as water is added to cement, rapid heat evolution takes place. Within few minutes, this is decreased and remains constant in plastic stage up to 3-5 hours until the concentration of the ions in the solutions before starting the precipitation of products of hydration.
When the maximum heat is evolved, CH crystallizes from the solution and a slow coating process of C-S-H product is started, which covers unreacted C_3S grains. As the hydration goes on, this coating becomes thicker and does not allow water to contact the un- hydrated core particles.

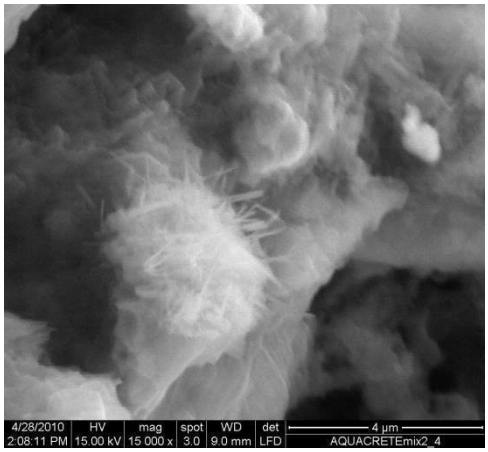
Nano particles of AQUACRETE® contacts all the particles of cementing material and produce the products under controlled hydration, which fill up pores and capillary pores. The capillary pores are known to be responsible for the impermeability of concrete. The size and number of pores are greatly reduced. As a result, the strength of concrete is also increased.

Scanning electron microscope shows the pores in concrete, development of different sizes of crystal in cement mortar after hydration. Nano particles are observed in the scanned photograph.

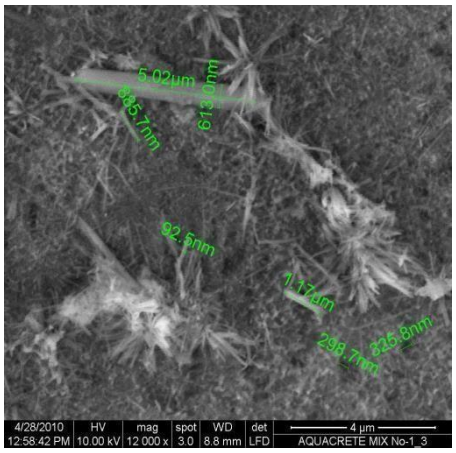
Scanning Electron Microscopic Views of the mortar with and without AQUACRETE®As per recommended dose@ 1LTR. PER 50 KG. BAG OF CEMENT in CONCRETE

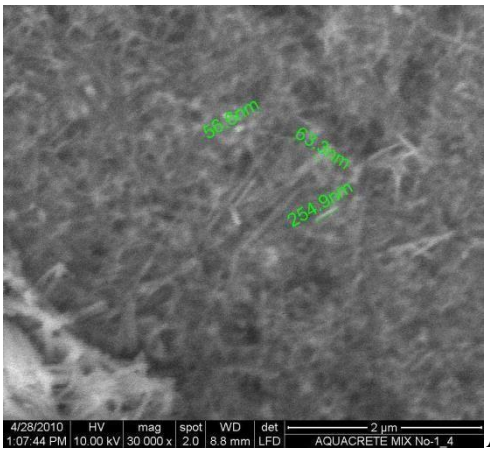


The scanning electron microscope photograph shows the capillaries and pores in a cement, sand mortar.
The sample is prepared without any additive.



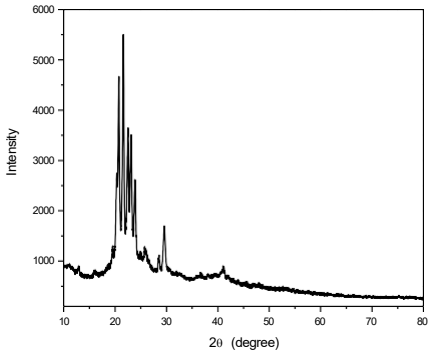
AQUACRETE produces crystals in cement mortar.



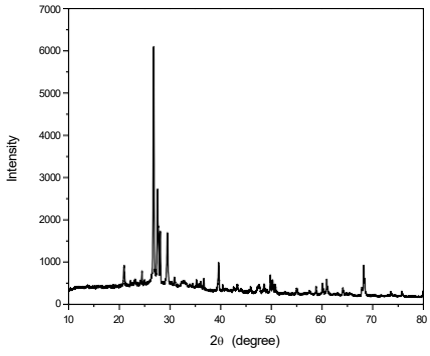


AQUACRETE makes crystal hydration products of different shape and sizes. Those plug the pores and the capillaries.

X-ray Diffraction Test

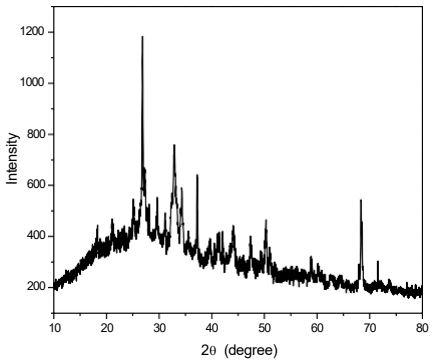


XRD-pattern of the product AQUACRETE



XRD-pattern of the normal mix of cement, sand mortar

After the product is added to the cement mortar, a different pattern is observed. This indicates the growth of the new hydration products in the concrete.
The crystals developed as hydration products fill up the capillaries. The following diffractograph shows the new properties developed after hydration.



XRD pattern of the concrete sample with additive AQUACRETE .

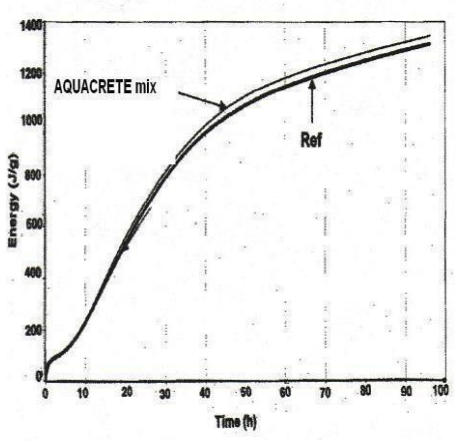
<u>Microanalysis study on the products of hydration with and without AQUACRETE</u>

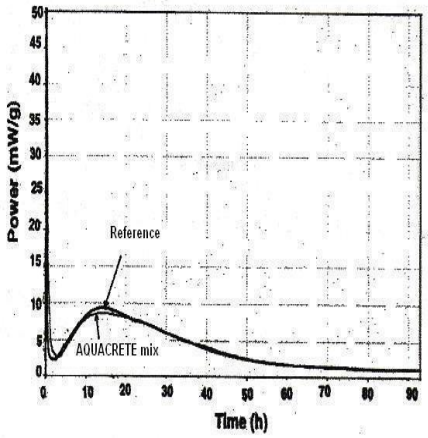
The microanalysis report of the mortar specimens shows no development of any new product after hydration. A foreign carbon particle from any external source is present in the concrete without AQUACRETE. But, the chemical composition of the concrete is unchanged after the reaction of cement and AQUACRETE. So, the waterproofing properties developed in the treated mortar are due to the presence of the same nature of crystal formed in the capillaries and the pores of the concrete. These crystals of different shapes and sizes plug the water ingression path without changing the basic properties of concrete. In the microanalysis report this is very clear, only the percentage of the elements are changed

Element	*Wt %*	*At %*
O K	31.61	51.52
AlK	03.52	03.40
SiK	10.36	09.62
CaK	54.51	35.46

Heat evolution during hydration

Heat evolution during hydration is plotted here.
The rate of heat evolution curve in the presence of AQUACRETE is slightly lower than the curve of a normal mix. Total heat evolved during the hydration is plotted here. This indicates the retardation of hydration.





From experimental results, it appears that in the presence of AQUACRETE, some nano particles are formed, which the products of hydration are. The extremely nano size particles have some favorable characteristics. Those fill up the pores and increase the strength of concrete. The microstructures of interface of cement and aggregate are greatly improved. This hinders the water percolation through the concrete.

Recommended dosage- @ 1Ltr. for R.C.C. Per 50 Kg. Cement or fines.

Uses





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