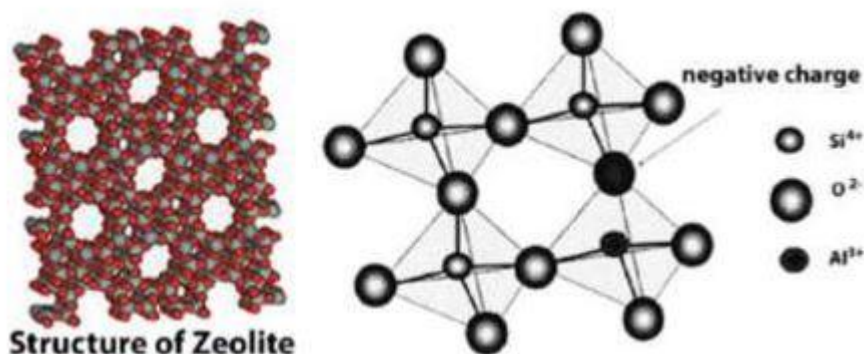


Nano Zeolite Cement Modification for Soil Stabilisation

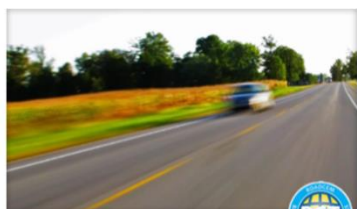
The stabilisation of soils by **RoadCem** Nano crystallization, is a process developed by PowerCem Technologies in the Netherlands and is activated by applying cement and water to any mixture of soils (organic and/or inorganic).

The porous and intricate nature of the zeolite structures created by **RoadCem** enables for the total hydration of the cement in the mixture, utilising close 100% of the cement powder during hydration, can reduce cement requirements by up to 30% compared to traditional cement stabilisation.

There is also a substantial increase in the length and quantity of calcium crystals produced that fill the voids occupied by moisture providing increased resistance and mechanical properties to the stabilisation.



Zeolites are aluminosilicate minerals of porous nature, in their natural state they have a three-dimensional panel structure, which stands out for its ability to hydrate and dehydrate. These minerals are normally found in both sedimentary and volcanic and metamorphic rocks. Based on the years of research by PowerCem BV into the structure of zeolites in their natural state, more than 150 variations of synthetic zeolites have been created which are now used to fulfil specific functions in all three PowerCem products.



RoadCem



ConcreCem

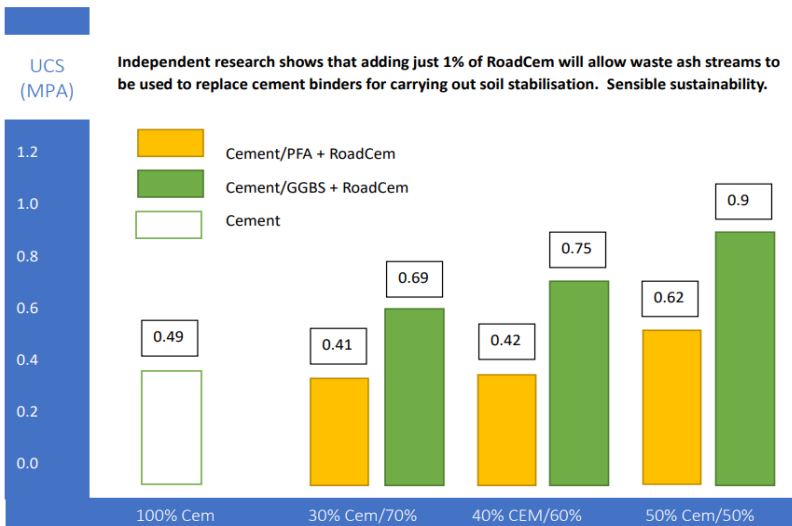


ImmoCem



The specially designed synthetic zeolites and other patented components allow stabilisation of any type of soil and provide unique properties that allow a better interaction between soil, cement, and zeolites to improve their characteristics.

The Nano stabilisation process created by PowerCem can take full advantage of the fine particles found in waste stream ashes; PFA, GGBS and IBA. Recent research by several UK Universities has shown that these ashes can be used to directly to replace cement in mixes by up to 70%, as shown in the following chart.



The above chart shows early seven-day results with a cohesive clay and are based on a mix design of 8% cementitious binder by volume of soil (approximately 4% by weight).

Whilst these results show the effectiveness of replacing high carbon cements with waste ash streams. The true benefit of the nano process is the increase in density and filling of voids by stimulating crystal growth during the hydration process.

Our UK partners Rodgers Leask Consulting Engineers can use the predictable strength results from RoadCem soil stabilisation provide design engineers and contractors with accurate bound soil foundation designs that are virtually crack free and impermeable.

Using Bisar strain analysis software high dynamic strength models can be tailored to meet client's foundation base loading requirements with a good margin of comfort for most ground conditions and soil types.

Nano soil stabilisation increases resilient stiffness, which:

- Increase permeability
- Reduces the risk of settlement
- Increases stability
- Improves shear strength
- Reduce the potential for swelling and shrinkage characteristics

Nano soil stabilisation acts as a water and weather resistant barrier when used for road base, working platforms and foundations for infrastructure elements, creating and maintaining a durable strength that will remain a constant for many years.

Sister products **ConcreCem** and **ImmoCem** also provide unique cement improvement properties, with **ConcreCem** the optimization of particle packing has been shown to effectively allow for higher percentage of waste ash streams to utilised as direct replacement for OPC. The Zeolites increasing the efficiency of these industrial waste ashes to increase stability in the final concrete product.

Adding **ImmoCem** to cement improves the treatment of contaminated soils and materials enabling the binding and encapsulation of almost any type of soil and/or material. The output composite material is resistant to water, acid and salt, this makes possible the use of waste contaminated soils and sludges. It is used in mixes of Concrete, Shotcrete Mortars and Backfill Paste. When treating tailings and sludges, it improves rheology, retards sedimentation, encapsulates contaminating compounds in solids and supernatant water and consolidates the Tailings/sludges.

For a truly sustainable low carbon alternative to importing crushed virgin stone to site or reusing existing weak or contaminated soils, please give our engineers a call on Freephone 0800 756 1360. The earlier we participate in your infrastructure plans the more cost effective the solutions can be.