

Technical Fact Sheet

TioCem[®] CEM II/A-S 42.5 R (tx)

Composition

TioCem is a Portland slag cement with photocatalytic properties and corresponds to a CEM II/A-S 42.5 R in accordance with DIN EN 197-1. TioCem consists of Portland cement clinker and slag sand as well as a sulphate agent which is required as a solidification agent. The slag sand content is normally between 6 and 20 wt.%. The cement also contains a nano-crystalline titanium dioxide. A high uniformity of the cement is achieved by the optimised production process. As a low-chromate cement it may also contain small amounts of a chromate-reduced additive.

Properties

TioCem has photocatalytic properties due to the use of special nano-crystalline titanium dioxide as a catalyst. These reduce nitric oxides contained in the air surrounding the concrete component. Photocatalysis is a natural process in which a catalyst increases the speed of a chemical reaction by the influence of light. Highly reactive radicals are formed on the surface of the catalyst under the influence of light which are able to react with organic and inorganic substances. The photocatalytic reaction can be repeated as often as necessary without using up the photocatalyst. By using TioCem in concrete, photocatalytically active concrete surfaces are produced which can make a major contribution to keeping the city air clean. Pollutant nitric oxides (NO_x) in the air are transformed into harmless nitrate (NO₃⁻) on the concrete surface.

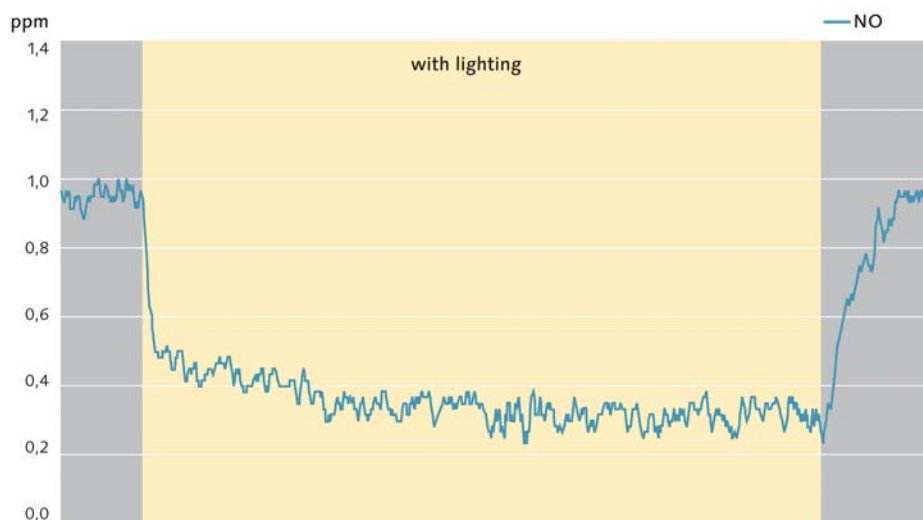


Fig. 1:
Example of the
reduction of nitrogen
monoxide by TioCem

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The nitrate produced by photocatalysis mineralises on the surface of the concrete and flows off the next time it rains. Nitric oxides not only present a direct health hazard for man but also form preliminary substances for the formation of health damaging ozone near the ground in summer. Photocatalytically active concrete surfaces therefore contribute to the reduction of summer smog.

TioCem is a cement of strength class 42.5 with a high initial strength. It is a low-chromate cement in accordance with the EU Directive 2003/53/EC.

Area of application

Photocatalysis is a light-induced reaction which takes place on the surface of the component. For this reason TioCem should be used at least in areas near to the surface. The use of TioCem in two layers in which TioCem is applied in a thin layer near to the surface is therefore very cost effective. Examples for such applications are

- paving stones,
- facade cladding elements,
- exterior roughcasts,
- noise and sight screen walls,
- road surfaces,
- concrete roofing,

TioCem is also suitable for the production of transport concrete and prefabricated concrete components.

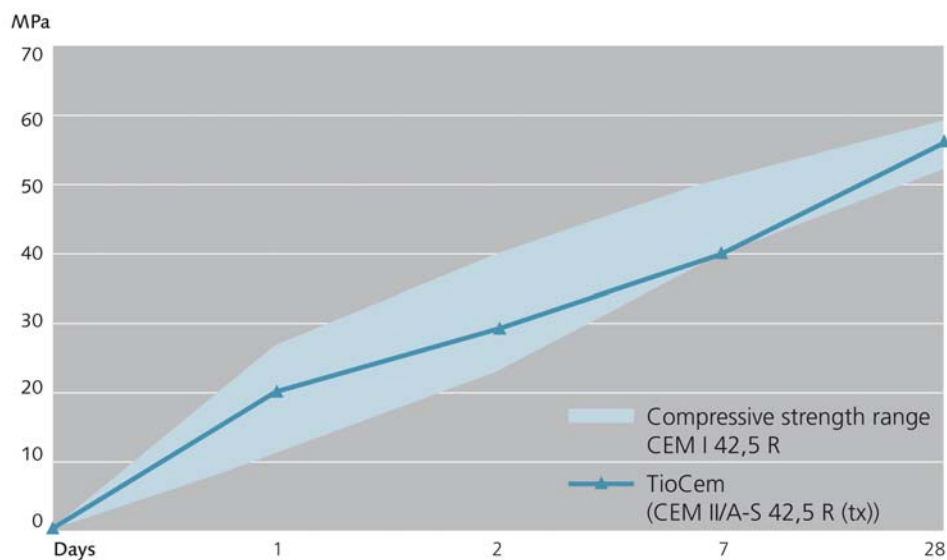


Fig. 2:
Typical strength
development of TioCem

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Practical hints

The recognised rules of technology, such as adequate post-treatment for protection against drying out and freezing, must be applied to exploit the full potential of the cement. Contact with the skin and eyes must be avoided at all times during handling as with all cements. Individual safety precautions such as the wearing of gloves and protective glasses are prescribed.

Environmental relevance

In addition to the thermal and electrical energy which lead to CO₂ emissions in the production of cement, considerable amounts of CO₂ are released when firing the Portland cement clinker as part of the process. CO₂ is climate-relevant greenhouse gas. Because of the reduced clinker content, the use of Portland slag cement reduces the volume of greenhouse gases which are emitted.

Supervision

CEM II/A-S 42.5 R is subjected to in-house production control in accordance with the conformity criteria of DIN EN 197-1 and is monitored externally by the Verein Deutscher Zementwerke e.V. (VDZ - Association of German Cement Works).

The photocatalytic functionality is also monitored during the production of TioCem. An independent standard has therefore been defined for the cement. To ensure that not only the cement but also the end product meets the high demands, HeidelbergCement tests the photocatalytic activity of the end products. Cement and end products which comply with the specifications of the standard are authorised to carry the TX Active[®] quality label. TX Active[®] is a quality label for the photocatalytic activity of building materials which is used throughout Europe.



Storage

Cements are sensitive to humidity and should therefore be stored in a dry place and protected from moisture. The low-chromate property of the cement is guaranteed for 6 months from the day of loading under proper storage conditions.

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Sales and technical advisory service

For further advice please contact:

HeidelbergCement AG, Verkaufsregion Südwest

Dammweg 1

55130 Mainz, Germany

Phone: +49 6131 805 - 385

Fax: +49 6131 805 - 250

mailto: vk-mainz-weisenau@heidelbergcement.com

HeidelbergCement AG, Verkaufsregion Nordwest

Zur Anneliese 7

59320 Ennigerloh, Germany

Phone: +49 2524 29 - 211

Fax: +49 2524 29 - 151

mailto: vk-ennigerloh@heidelbergcement.com

Edition unchanged since: March 2010

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