

# Mineral industrial floors, crack-free and highly resistant as design floors, especially under aesthetic aspects

Dr. Jörg Rathenow  
Sinnotec Innovation Consulting GmbH, Wiesbaden, Germany, [www.sinnotec.eu](http://www.sinnotec.eu)

## Summary

Floors in restaurants and hotels are very similar to concrete floors in industrial laboratories, production facilities and warehouses - they are almost permanently exposed to exceptionally intensive use. Preventing signs of wear and tear and premature wear and tear requires materials specifically adapted to the respective object and its maximum load in the case of new construction and renovation. With the Sinnotec silicate technology, a jointless floor for extreme wear and tear can even be applied to the old floor, for example on old tiles. The patented system is based on water glass, which reacts specifically with calcium compounds and hardens without stress. Sinnotec differentiates between two different systems: Aqueous, silicate impregnations as concrete refinement of existing concrete substrates or mineral levelling compounds as well as wall mortars as liquid-tight coating materials. Particularly from an optical point of view, silicate products offer a wide range of application variants, which, in addition to excellent durability and ease of application, also allow a variety of design aspects to be realized. The Danish Stoerebelt Bridge ([1](#), [2](#)) is among the references, as is the world-famous Sydney Opera House in Australia ([3](#)), tank farms (LAU plants), production areas (HBV plants) and BASF sewage treatment plants, high-bay warehouses, swimming pools, oil cellars in the steel industry or renovations in biodiesel production facilities. This not only provides excellent adhesive re-profiling, but also ensures a lasting, liquid tight protection for the groundwater and corrosion protection of the steel reinforcement.

## 1. One coating for all floors

When it comes to coating materials, we always come across the same basic requirements that have to be met in new buildings, modernizations and renovations:



Picture 1, Restaurant of a hotel, renovation during operation

\* to create a perfect, secure adhesion base for the desired new coating on the existing substrate,

\* to find a coating option that is both ecologically acceptable and economically viable,

\* to guarantee simple, fast and simultaneously safe processing,

\* also to leave the client and his architect maximum freedom of decision in design matters.

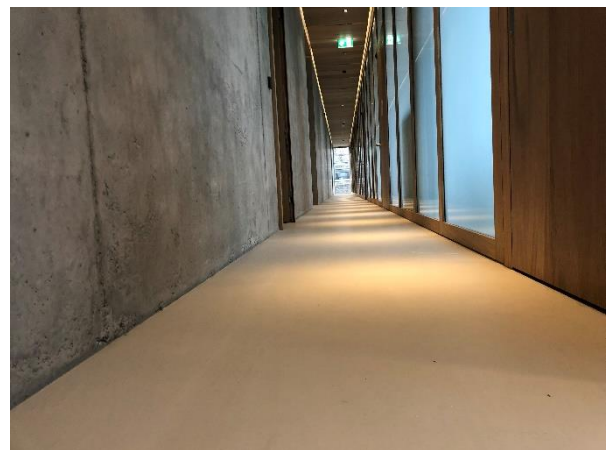


Figure 2, Sinnofloor industrial floor with high optical and chemical requirements

The removal or milling off of the existing worn coating is therefore no longer necessary. The advantages are obvious: Floor modernization without interrupting business operations, immediate increase in visual attractiveness and maximum functional reliability are offered with floor renovation or new construction with Sinnotec silicate products.

## 2. The innovative Sinnotec silicate technology

The Sinnotec silicate technology is based on the targeted reaction of water glass with calcium compounds in the substrate (e.g. concrete, concrete finishing, dust-binding paint) or latent hydraulic binders such as granulated blast furnace slag or other geopolymers. These are one-component powder products which are produced on the basis of alkaline activated granulated blast furnace slag by water glass as purely inorganic materials. For this purpose, investigations have already been carried out in the past by Glukhovskiy on the alkaline activation of binders (4, 5) and by Davidovitis (6) on the three-dimensional cross-linking of inorganic binders.

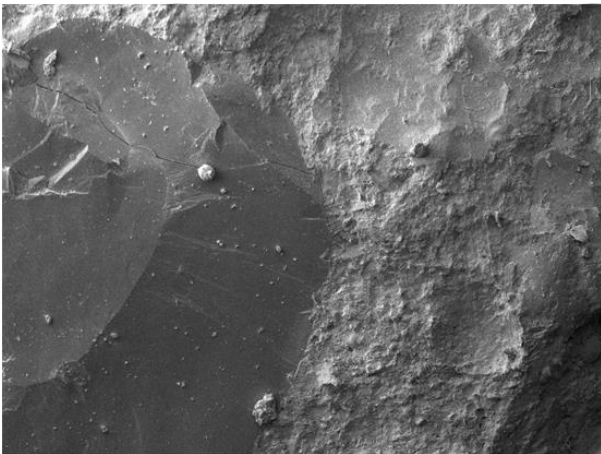


Figure 3, dense silicate matrix with incorporated sand grain (7)

Sinnotec mortars are based on the exact stoichiometry of calcium, silicate and water, which then cross-link cleanly to form a binder matrix of waterproof, three-dimensionally cross-linked CSH, without the undesirable by-product calcium hydroxide being formed. One can imagine this reaction as a room temperature curing ceramic that cures without stress.

### Comfortable application for all surfaces

A similarly high level of resistance is required for floor modernization in the gastronomy sector, especially in popular restaurants and preferred hotels. For reasons of hygiene, slip resistance and design freedom, a jointless floor coating using Sinnotec silicate technology is recommended here.

In restaurants and hotels the challenge to be mastered is the daily wear and tear on the floor caused by the constant coming and going of countless pairs of street shoes, scratching stones in leather and rubber soles, rough table and chair backs, and the occasional falling cutlery, glasses and crockery. A floor that is to do justice to a flourishing catering or hotel business must therefore be able to withstand all kinds of wear and tear - not to mention frequent cleaning with all kinds of cleaning agents. In addition to the above-average mechanical load-bearing capacity, there are further requirements that the floor

design must meet: In addition to maximum robustness, aspects such as aesthetic appearance, hygiene, slip resistance, workability, environmental friendliness and, last but not least, colour and structural design must be taken into account.

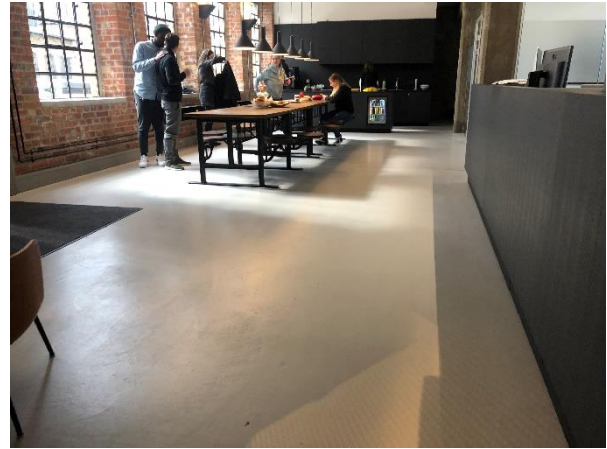


Figure 4, Durable Sinnofloor industrial floor

Caterers and hotel operators who are considering modernization, as well as their architects and building contractors, are faced with the task of choosing a suitable floor coating that can be considered an all-round talent and achieves top marks in every conceivable individual discipline.

### Ambience modernised from the ground up

The example of the restaurant "Schöne Aussicht" impressively demonstrates how these requirements can be combined. Here, the task was to professionally apply a seamless coating (for hygienic and design reasons) to an existing (still load-bearing, but visually unfashionable) tiled floor in the shortest possible time (in order to avoid longer interruptions to operations and keep income losses as low as possible). For this purpose, the substrate was first thoroughly cleaned and then prepared as an adhesive base using Sinnofloor primer.

After extensive investigations, including adhesive tensile tests, we were able to assume that the existing tile covering was suitable as a substrate for a silicate Sinnotec coating.

### Hygienically clean in operation

At the request of the hotelier, the old tiled flooring was to be converted into a hard-wearing, hygienically impeccable designer flooring without interrupting ongoing catering operations. It was crucial that the floor work was carried out as quickly as possible and at the same time professionally and that the silicate products to be processed proved to be odourless. In the course of the jointless coating of the primed tiles, therefore, the levelling

compound Sinnofloor Design grey was used, as well as Sinnofloor CW 2in1 for oil-resistant impregnation the following day. Since then, the surface has proved to be non-slip and well protected against mechanical stress, soiling of all kinds and chemical substances such as aggressive cleaning agents. The separately designed floor presents itself seamlessly throughout and thus top-hygienic, which is also proven by the sealing groove, which was professionally raised on the surrounding walls in the base area. All in all: the renovated floor in the restaurant could hardly have been easier to maintain and more robust.



Figure 5, Sinnofloor Design, jointless industrial flooring, crack-free and highly resilient, also for exterior surfaces and wet room floors

### 3. The innovative silicate technology for impregnations

The concrete refinement by Sinnotec Silicate Chemistry is essentially based on the reaction of calcium with water glass to form calcium silicate hydrate (CSH). Impregnation by Sinnotec products is thus the chemical reaction of calcium hydroxide with water glass (silicate) to form calcium silicate hydrate, thereby solidifying the microstructure (CSH is no longer water soluble and thermodynamically stable) and sealing the capillary porosity. Sinnofloor© Impregnation for concrete finishing is a one-component dust-binding coating system (water-based, VOC-free) which can be easily applied by spraying or wiping onto the concrete surface.



Figure 6, spray application Impregnation, large surface

This reduces the water absorption of the concrete matrix to almost zero. Since no water can penetrate the concrete matrix and no reactive calcium hydroxide is present on the concrete surface, there is no more freeze-thaw corrosion, no more efflorescence and, due to the lack of food for the microorganisms, no more growth - biocide free (8)!

In addition, the corrosion protection of the steel reinforcement is realized by the highly alkaline silicate impregnations and sealed watertight for a long time (concrete repair active principle W).

Substrates protected in this way remain sustainably free of corrosion and microbiological growth, are easy to clean, have an aesthetic shine and thus have a significantly longer service life.



Figure 7, Industrial concrete floor for intensive forklift access, spray application after cleaning

For existing substrates there are water-based products based on water glass, which react with the calcium already present in the substrate, thereby sealing and consolidating it (concrete finishing, protection against soiling, one-component dust-binding coating, impregnation). These purely inorganic binders and impregnations are water-based, VOC-free, have the fire properties A1 (non-flammable), are free of microplastic, electrically conductive, 100% recyclable and have drinking water approval.

#### 4. The flexible use for many applications

In addition to the catering trade, such versatile coatings and impregnations can be used for other areas of application due to their excellent adhesion to the substrate, high durability, convenient processing and rapid curing as well as their excellent environmental compatibility.

The high mechanical stability of the coating materials and impregnations are forklift accessible and are therefore perfectly suited for the protection and equipment of high-bay warehouses and industrial floors. An outstanding reference is the high-bay warehouse of Estée Lauder in Lachen, Switzerland.

Due to the high chemical stability, which is applied liquid-tight and crack-free on the surfaces, applications for laboratories, production plants, storage areas, HBV-plants, LAU-plants (9) in chemical, pharmaceutical, agricultural and food industry are comfortable and can also be realized as renovation during operation. The best protected reference is the new and highest production building L900 of BASF in Ludwigshafen, where the entire production and storage area is protected over 14.000m<sup>2</sup> over 7 floors with 84 meters height.

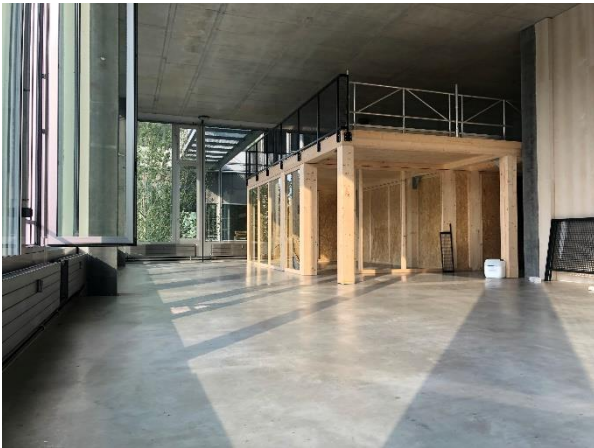


Figure 8, Yond, Zurich most flexible rooms for innovative companies

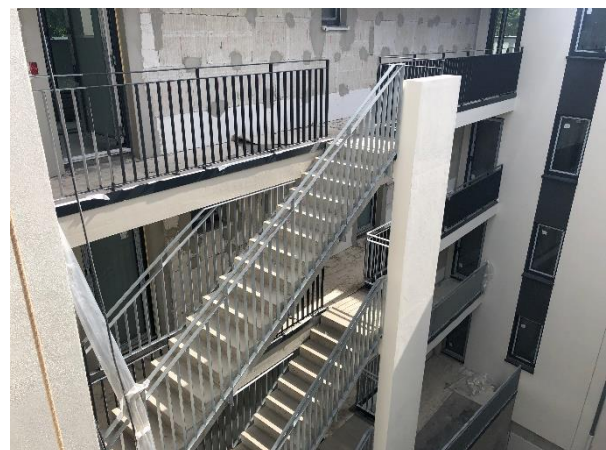
The many possibilities for flexible design of Sinnofloor coatings make design areas for offices, production areas, schools, hospitals, kindergartens, museums, terrazzo and design floors possible. A very nice reference here is the innovative production building Yond in Zurich ("Zurich's most flexible rooms for innovative companies), where mineral impregnations were used on all levels.



Figure 9, Frankfurt's urban drainage system, trafficable ground areas

The inorganic coating materials and impregnations are extremely weather-resistant and therefore offer excellent corrosion protection for exterior and interior applications. In this way, sewage treatment plants, bridges, underground car parks, exposed concrete facades can be sustainably protected against damaging influences such as road salt, freeze-thaw spalling, microbiological growth or corrosion of the steel reinforcement (10, 11, 12). Through the cooperation in the DWA (German association for water management, waste water and waste), the new set of rules DWA-M 143-17 (13) has been created, in which the silicate mortars for the rehabilitation of sewage structures are described and approved. A clean reference here are the rain overflow basins in Lachen. The sustainable restoration and protection of surfaces using Sinnodur products guarantees that no microplastics can get into Lake Zurich.

Since the drying process of the inorganic coatings and impregnations is almost stress-free, large areas can be realized without cracks and without joints.



Picture 9, pergolas fully weathered in Hanau

The inorganic material base always provides fire protection according to A1 and is non-combustible and stable at high temperatures up to 600°C. Therefore, these materials offer an ideal high-temperature

corrosion protection as well as corrosion protection for cryogenic applications (14), e.g. for pergolas and fire protection for wooden structures. A reliable reference here are the pergolas of the residential complex in Hamm and Hanau.

Since Sinnotec products are mixed with water in an exemplary and environmentally friendly manner and do not contain any other hazardous ingredients or solvents, they have drinking water approval and are free of microplastics. Thus, an application in swimming pools and drinking water structures is ideally realizable. Due to its excellent environmental compatibility, we have currently implemented a cooperation with Ar-dex and Bau-Fritz for a very low-emission design floor in residential construction. The shining reference here is the swimming pool made of white concrete (Jura lime) in Dornach, Switzerland.



Figure 10, Pool made of white Jura cement, fully protected

## Summary

The silicate technology of Sinnotec GmbH is an innovative approach in concrete repair, which directly addresses the cause of concrete corrosion, namely the chemical reaction of the reactive, acid-sensitive secondary component calcium hydroxide in the concrete matrix. The conversion into thermodynamically stable calcium silicate hydrate (CSH) simultaneously seals the capillary porosity of the concrete matrix and provides lasting inorganic protection. By realkalizing and waterproofing the steel reinforcement (active principle W), a lasting protection of reinforced concrete and aesthetically beautiful floors with high sustainability is achieved.



Figure 11, High-bay warehouse for water-polluting substances, production area for water-polluting substances

By grinding, polishing, mixing in decorative grain (terrazzo) and/or colouring, even design floors can be produced easily and safely. The three-dimensional cross-linking of the CSH phases results in high strength and wear resistance, making the floors highly durable and suitable for forklift traffic. In addition, the skid resistance can be easily adjusted with a good electrical conductivity similar to concrete and a fire protection according to A1. Due to environmentally friendly raw materials and water as a solvent, very ecological and emission-free floor coverings are created as room temperature hardening ceramics from the raw materials through processing, use and recycling.

These materials are therefore predestined as sealing (even in case of rear moisture penetration and salt contaminated substrates) for industrial floors and can even be used with aggressive media, such as water-polluting substances (16, 17, 18) according to the tightened Water Resources Act (WHG) for HBV systems (production areas, industrial floors) and LAU systems (e.g. tank farms, tank and storage areas).



Figure 12, reprofiled concrete in industrial sewage treatment plant according to WHG

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