Technical Data Sheet

CaLoSiL®

Prevention of white haze formation

Whitening of surfaces treated with nanolime dispersions, often also called "white haze formation", may have two completely different reasons:

- When dense surfaces or substrates are treated which are characterized by a low porosity and a low suction behavior, the formation of white haze is caused by an insufficient penetration of nanolime into the structure. The same can be observed when the nanolime content of the used product is too high or when material which could not penetrate into the substrate remains on the surface. Essential is that the nanolime concentration is adjusted to the structure and the characteristics of the substrates to be treated. It has always been favourable to start with a low concentrated product (CaloSiL®E5) and to increase the concentration in further steps. All CaLoSiL® products can be diluted by using conventional, denatured ethanol or iso-propanol / n-propanol. Although nanolime has a small particle size, the penetration behavior of the dispersion is still dependent on the pore / crack size of the substrate to be treated. It is commonly known, that dispersions are able to penetrate a substrate when the pore size is approximately five times greater than the particle size of the dispersed solids. The maximum particle size of nanolime is ~250 nm, meaning that the pores to be treated must have radii greater than 1.25 µm. Additionally, it has to be regarded that in fine pores and cracks transport is only possible by capillarity. This requires "open" flow paths. Natural weathering, biological growth or the deposition of dust particles reduce the pore space often and creates hydrophobic pore walls. Pre-wetting with water or water/ethanol mixtures 24 hours ahead the applicant of the nanolime dispersions opens the pore space and supports the penetration. Important is that the substrate is dry during the application of the nanolime dispersion. Otherwise white haze formation is possible.
- When the solvent of the nanolime dispersion evaporates too fast, the fine lime particles can be transported back to the surface, forming a white bloom. This can be overcome by the following measures:
    - Application of CaLoSiL® at low temperatures and without direct exposition to direct sunlight.
    - Covering of treated surfaces with plastic foil in order to prevent fast evaporation.
    - Careful after-spraying with water. The capillarity of water is higher than those of nanolime dispersions. Thus, water pushes the nanolime dispersion deeper into the substrate. Additionally, fast evaporation is prevented.
    - Aftertreatment with 0.5 wt.-% solution of hydroxypropyl cellulose in ethanol/water mixtures (1:1).
    - Addition of small volume of CaloSiL® micro to the nanolime dispersions.

The carbonation of conventional air lime as well as nanolime requires the presence of moisture. Without moisture, carbon dioxide is unable to react with $Ca(OH)_2$. In the case of low moisture contents, the formation of thermodynamically metastable $CaCO_3$ modifications such as Aragonite or Vaterite takes place often in the first step. These convert over time into the stable modification Calcite. Moisture contents above 75 % RH, however, lead to the direct formation of Calcite. Thus, it is always recommended to generate conditions with higher humidity, for example by covering treated surfaces with wet clothes.

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The successful use of nanolime dispersions requires a good characterisation of the substrate to be treated as well as the selection of the most suitable application technique. It cannot be expected that nanolime dispersions are able to penetrate dense skins, for example formed by gypsum, dust and biological growth. When loose zones behind such impermeable layers are to consolidate, it is necessary to bring the stone strengthener through drillholes into these areas. Many applications showed that the nanolime dispersions can be applied by spraying, vacuum suction or injection. Brushing, however, was in the most cases not successful. The mechanical action of the brush liberates fine particles which block fine opening such as cracks or pores.

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