

# NawKote-PC Case Study

by Nawkaw

## Table of Contents

<b>Executive Summary</b> .....	<b>1</b>
<b>Introduction</b> .....	<b>2</b>
<b>Challenges</b> .....	<b>2</b>
<b>Discoloration</b> .....	<b>2</b>
<b>Carbonation</b> .....	<b>2</b>
<b>Fungus and Black Algae</b> .....	<b>2</b>
<b>Ultraviolet Light</b> .....	<b>2</b>
<b>Graffiti</b> .....	<b>3</b>
<b>Solution</b> .....	<b>3</b>
<b>Benefits</b> .....	<b>4</b>
<b>Results</b> .....	<b>4</b>

## Executive Summary

Building with concrete has many benefits to it. However, the construction industry encounters different challenges and architects, property managers and contractors are looking for a solution that protects the concrete from dirt and other build-ups while improving the longevity of the concrete and preventing carbonation.

To meet the rising demand of the industry, Nawkaw introduces NawKote-PC, a clear coating that protects concrete and adds a variety of beneficial properties to it and other building materials.

Japanese scientist Prof. Fujishima discovered the technology behind NawKote-PC in 1967. The clear, water-based, nontoxic, zero-VOC, and solvent-free coating system consists of an environmentally-friendly high-quality formulation and contains photocatalytic TiO<sub>2</sub> nanoparticles that build a lasting protective-barrier. By harnessing nature’s powers such as sunlight and rain, the photocatalytic layer is activated by UV-rays while the rain washes dirt and dust away and prevents pollutants from sticking to the surface and even decomposes them.

As a result, buildings keep their looks for years to come while contributing to a healthier environment and property owners will save time and money on maintenance for their buildings.

## Introduction

Nawkaw has been a manufacturer and service provider for concrete and masonry stains for over 30 years. With strong presences in USA, Canada and, Australia, we strive to develop innovative products that are not only harmless to the environment but in fact, contribute to a better place to live and work in, while significantly improving the longevity of concrete and other building materials.

Nawkaw introduces NawKote-PC to meet the construction industry's rising demand for a coating that protects the building material and provides beneficial attributions on top of that. NawKote-PC is a clear coating which can be applied on many different surfaces, including but not limited to glass, tile, painted surfaces, precast concrete, brickwork, and masonry. For several years, it has been rigorously tested and has had great success in Australia before the launch for the American and Canadian market in 2019.

This brief case study explains the challenges that all buildings encounter – in particular, concrete structures. The study also elaborates on the technology behind NawKote-PC and its beneficial properties. To showcase the results of this project, Nawkaw has included photos that prove the positive outcome.

## Challenges

Concrete is being used for residential and commercial projects. While it maintains a timeless look, and comes with many benefits, it also has different issues to overcome.

### Discoloration

Discoloration can occur for several reasons, e.g., due to different curing time, material exposure or weather conditions. Air pollution and dirt are additional factors that will lead to an unsightly appearance. As a result, buildings seem unappealing and stand out from their surroundings.

### Carbonation

The carbonation of concrete is a severe problem for the concrete industry. When the carbon dioxide from the environment dissolves in the pore water and reacts with the calcium hydroxide in the cement paste, it causes carbonation which will result in porous, friable and weak concrete. Carbonation is even more troublesome in the steel-reinforced concrete as in the long run, due to higher levels of water ingress and lowered pH of concrete it can lead to corrosion of steel reinforcement.

### Fungus and Black Algae

Mildew and black algae buildup usually arise in damp areas and regions with little sunlight. At its best, it is only an unsightly nuisance, but at its worst, it could be a health hazard for anyone nearby. The kind of mold that grows on concrete often turns out to be toxic black mold that can only be removed professionally. With the current design trends leaning towards white, very light-colored facades, this may be even more of a problem.

### Ultraviolet Light

Harsh UV-rays from the sun will damage concrete's surfaces over time, especially when wholly exposed to the sunlight. The pigments in the concrete surface will fade which leads to color loss and blemishes. The UV-light also breaks down polymers and other bond chains within the concrete. Cracks and spalling will occur and weaken the concrete which will eventually lead to more serious structural issues.

## Graffiti

A common concern amongst property managers is graffiti on their buildings. Graffiti can be unaesthetic and lead to a widespread community concern. Especially metropolises are affected. Unfortunately, removing them commercially comes at an enormous expense.

## Solution

Nawkaw is proud to present a solution for the issues the American and Canadian concrete industry is experiencing. NawKote-PC is a clear, water-based, nontoxic, zero-VOC, and solvent-free coating system that gives the treated area properties that help to prevent carbonation, algae-buildup, protect the concrete from harsh UV-light and even from graffiti, while it provides self-cleaning attributes. The coating consists of a high-quality, unique formulation including photocatalytic TiO<sub>2</sub> nanoparticles that will build a long-lasting protective barrier. NawKote-PC makes use of nature's natural powers. By using only rainwater and sunlight, it shields surfaces from harmful environmental pollutants, while decomposing those contaminants. NawKote-PC functions in all weather conditions – sunshine, rain or during overcast days, the UV-rays will suffice to activate the photocatalytic layer of the coating. The technology behind NawKote-PC was first discovered in 1967 by Japanese scientist Prof. Fujishima. In order to standardize photocatalytic products, the Photocatalysis Industry Association of Japan (PIAJ) was established in 2006 with the goal to promote and improve the quality, performance, and safety of those products. Since 2016, Nawkaw has been testing the new technology and has had great success with it in Australia. Specifications for NawKote-PC are stated below:

Typical Specifications	
<b>Accelerated Carbonation Neutralization coefficient:</b>	0mm/t <sup>2</sup> (JIS A1 152)
<b>Decomposition of NO<sub>x</sub>:</b>	0.7392 mmol/m <sup>2</sup> (JIS R1701-1:2004;8h)
<b>Permanent Graffiti Barrier APAS1441:</b>	pass
<b>VOC:</b>	0 g/L (SCAQMDR 1168)
<b>Water Permeability:</b>	0.2 mL (JIS A6909)
<b>UV Resistant &amp; Weather Resistant:</b>	excellent (ASTM G154)
<b>Application Temperature:</b>	41° – 110°F (5° – 43°C)
<b>Dry Time for Reapplication (if required):</b>	20 minutes
<b>Shelf-Life:</b>	12 months in factory sealed container

## Benefits

NawKote-PC's coating provides many beneficial characteristics that will help to maintain the looks of buildings and due to its self-cleaning properties will reduce life-cycle costs. The treated surfaces carry no electric charge and reduce the absorption of dust and dirt. The hydrophilic surface wets out evenly which leads to faster drying and dramatically reduces the dirt sticking to the surface. When sunlight activates NawKote-PC, harmful air-borne pollutants, viruses, bacteria, mold, VOCs, CFCs, allergens, and smog will decompose, leading to a more sustainable, better environment. Furthermore, the air stays fresher, due to the deodorizing properties of the coated surfaces.

For long-term protection, NawKote-PC will prevent concrete carbonation. The inorganic NawKote-PC coating system will protect the pores of the concrete, to restrict water ingress which will slow down the natural carbonation process, preventing concrete from loss of durability and protecting steel reinforcement.

The sustainable aspect provided by the photocatalytic coating is a significant contribution to improve the all-over life quality in our cities. To put the capabilities of the NawKote-PC into relation: An area of 250 sq. ft coated with NawKote-PC purifies just as much air as one tree, which can remove the equivalent of NO<sub>x</sub> emitted by two automobiles. Our scientists are currently conducting further research.

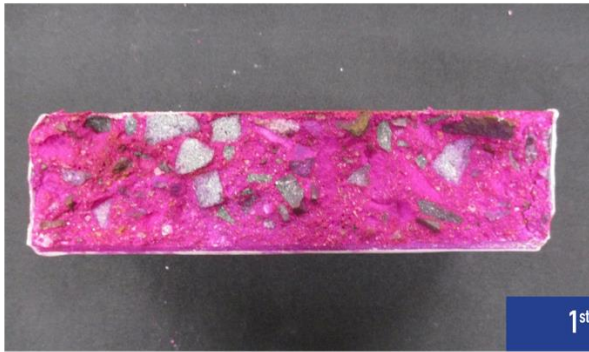
## Results

As a result, buildings will keep its looks for years to come. The beneficial attributes lead to a reduction of maintenance costs and will create a great first impression for anyone passing the building, including clients, employees, and people of the local community.

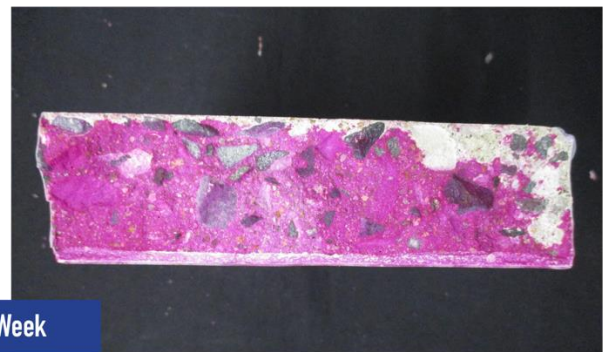
To demonstrate that carbonation can be prevented by applying NawKote-PC, carbonation of untreated and NawKote-PC coated concrete was compared. The depth of carbonation can be determined after the phenolphthalein solution has been applied to the cross-section of concrete. The carbonated concrete exhibits no color change in the outermost portion. Concrete treated with NawKote-PC does not show any signs of carbonation (indicator turns fuchsia).

Treated with NawKote-PC

Untreated



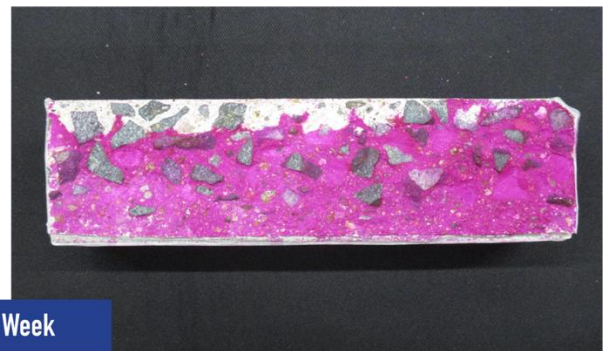
1<sup>st</sup> Week



2<sup>nd</sup> Week



4<sup>th</sup> Week



26<sup>th</sup> Week

To show evidence of the self-cleaning attributes, two strikes of graffiti were applied onto a concrete panel that was treated with NawKote-PC before the experiment. Using only daylight and rainwater, NawKote-PC harnesses the power of nature to remove the graffiti. The photos clearly show how the strikes are fading with time.

