

FT-IR Analysis of Flooring Adhesives Exposed to Concrete Pore Water

Analytical proof of pH and moisture tolerance

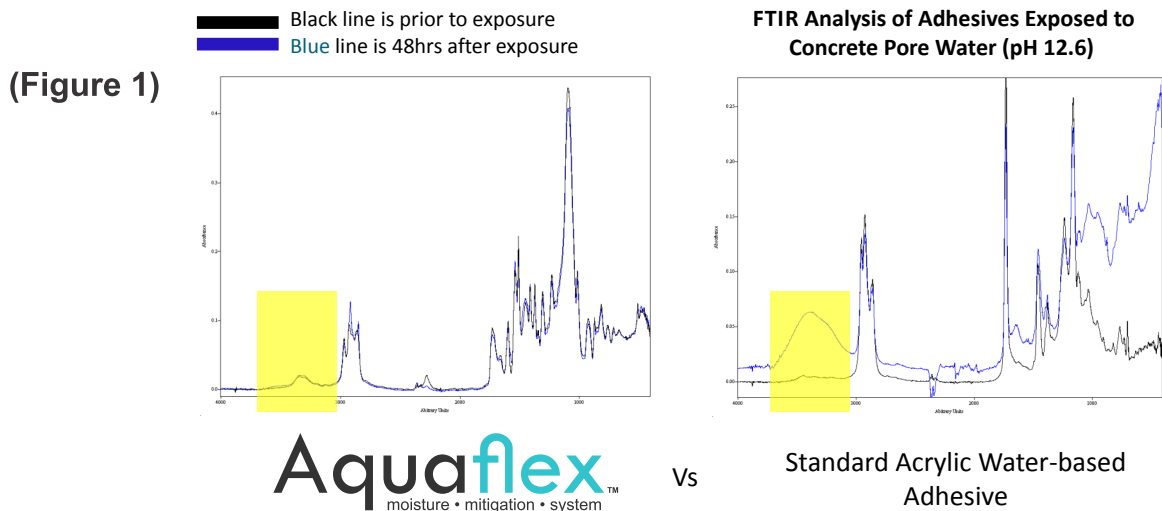
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FT-IR (Fourier Transform Infrared) spectroscopy is a unique analytic tool that uses a mathematical expression to transform data measured when Infrared light is passed through a chemical substance into a unique spectral graph. As light passes, certain wavelengths are absorbed dependent upon the molecular structure of the chemical sample. The data is collected and a spectrum is created of the samples molecular fingerprint. Just like a fingerprint, no two unique compositional structures produce the same spectra.

In this study we attempted to determine if pH degradation could be identified in flooring adhesive samples exposed to a solution of concrete pore water. Two adhesive samples were chosen for the investigation. The first was the patented, waterproof adhesive Aquaflex. The second, a standard water-based acrylic adhesive with a reported high moisture tolerance recommended by a prominent flooring manufacturer. The solution selected to represent concrete pore water for the exposure is described by ASTM D7705. The composition of the alkaline pore water solution consisted of 118.5g of $\text{Ca}(\text{OH})_2$, 0.9g of NaOH and 4.2 of KOH in 1L of tap water with final pH between 12.6 and 13.0.

Adhesive samples were prepared by applying a measured quantity to a glass slide and allowed to cure. After 2hrs of cure time the samples were analyzed by FT-IR to obtain an “unexposed” spectra for baseline comparison. The samples were then immersed into the simulated pore water and allowed to dwell for 48hrs of exposure. After the 48hrs exposure, the samples were removed and rinsed with distilled water and allowed to air dry for 1hr.



The exposed samples were analyzed by FT-IR and the spectrum created was over-layered on the previous “unexposed” spectrum for comparison. In the case of the standard acrylic adhesive, the 48hr spectrum exhibited a significant increase in the area surrounding the 3400cm^{-1} wavelength (see the yellow area in Figure 1). This area of the spectrum is associated with chemical bonds C-O, C-O-H and O-H absorption. These groups are characteristic of the by-products of pH hydrolysis or the destructive activity of elevated pH on an organic material. Notice the obvious lack of change to the Aquaflex spectrum. The spectra match up so perfectly it looks like one spectrum. Extended studies on Aquaflex at 20 days exposure provides the identical spectral result. Therefore, by this evaluation Aquaflex is proven by FT-IR analysis to be completely water-proof and chemically stable to excessive pH associated with concrete pore water attack.