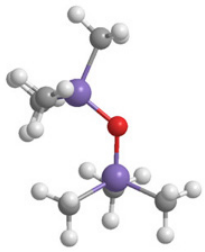
TECHNICAL BULLETIN CP-19

# SILANE AND SILOXANE WATER REPELLENTS FOR CONCRETE AND MASONRY

EUCLID CHEMICAL

Cementitious building materials such as concrete, mortar, and masonry tend to readily absorb water because of their pore and capillary structure. To prevent damage due to moisture absorption, the material's absorbency can be reduced by the application of a water repellent sealer.



Silanes and siloxanes, the two most common types of water repellents, are both derived from the silicone molecule. Silicone is a generic name for a wide variety of polymeric chains constructed around a molecular backbone of SILICON - OXYGEN - SILICON (image at left). Despite being very closely related, silanes and siloxanes they have significant performance differences that will be explained below. But first, here are general similarities between silane and siloxane sealers:

- Both are penetrating-type sealers.
- Both allow the substrate to breathe, allowing moisture vapor to escape while repelling water from the outside.
- There is little or no change to the appearance of the substrates to which they are applied — no gloss is imparted to the surface.

When applied, silane water repellents penetrate into the substrate and react chemically with calcium hydroxide to form a hydrophobic, water repellent resin within the pores and on the surface. In order for this chemical reaction to take place, the substrate must be alkaline (high pH); it must contain calcium hydroxide. Therefore, silanes formulated for concrete and masonry are not effective in sealing other substrates such as natural stone, clay brick, or wood.

Unlike silanes, siloxanes are not dependent on substrate pH to react. Siloxanes can react with atmospheric moisture as well as any moisture in the substrate to form the hydrophobic resin. Because of this, siloxanes are ideal for treating non-cementitious building materials such as brick, stucco, and stone.

Since silanes are made up of smaller molecules than siloxanes, they typically will penetrate deeper than siloxanes and thus perform better on dense surfaces such as poured-in-place and precast concrete. A consequence, however, of this small molecular size is that silanes are quite volatile. Therefore, the solids content of a silane water repellent should be high enough to compensate for the evaporation of reactive material during application and curing.

Siloxanes have a slightly larger molecular structure and are somewhat effective on substrates up to medium porosity such as heavyweight, smooth-faced, concrete block. Unlike silanes, their chemical composition does not encourage rapid evaporation. Therefore, their solids content is usually less than that of silanes.