“Very early in the hydration of cement, calcium ions are incorporated in the hydration products, but potassium and sodium stay in solution and eventually they are partially incorporated into calcium silicate hydrate (C-S-H) and monosulfate (AF_m) . Hydroxide ions from the hydration of Portland cement result in a pore solution having a pH of at least 12.5. Soluble alkalis raise the pH to about 13 or higher. Also, the amount of alkalis present in the pore water is related to the amount of soluble alkalis present in the cement. The hydroxide ions will attack the silica surface.” CF Ferraris Alkali-Silica Reaction and High Performance Concrete August, 1995 National Institute of Standards and Technology

“Lithium silicates are quite insoluble and do not absorb water. They are much more stable over a wider range than potassium or sodium silicates.” David Stokes FMC corporation 1996

“ (a) Mechanism. Naturally occurring sulfates of sodium, potassium, calcium, or magnesium are sometimes found in soil or in solution in ground water adjacent to concrete structures [Or in sodium or potassium silicates added to concrete as hardeners] The sulfate ions in solution will attack the concrete. There are apparently two chemical reactions involved in sulfate attack on concrete. First, the sulfate reacts with free calcium hydroxide, which is liberated during the hydration of the cement to form calcium sulfate (gypsum). Next, the gypsum combines with hydrated calcium aluminate to form calcium sulfoaluminate (ettringite). Both of there reactions result in an increase in volume. The second reaction is mainly responsible for most of the disruption caused by volume increase of the concrete (ACI 201.2R) . . .
(b) Symptoms. Visual examination will show map and pattern cracking as well as general disintegration of concrete.” EM 1110-2-2002 20 June 95 (www.usace.army.mil/inet/usace-docs/eng-manuals/em1110-2-2002/c-3.pdf)

1. Lithium is insoluble.
2. Lithium does not absorb water and expand.
3. Lithium is not a naturally occurring sulfate and will not contribute to sulfate attack.
4. Lithium reactions are calmer and more even throughout the surface layer of the concrete than sodium or potassium reactions.
5. Lithium reacts with calcium hydroxide in the capillary channels of the concrete to form complex tricalcium silicate compounds that keep moisture out—moisture from humidity as well as cleaning.
6. Lithium hardens up to 40% more compared to 26% for sodium/potassium silicates.