TECH TIPS FROM NASSCO

PART 3

STEPS TO UNDERSTAND WHAT HAPPENS TO STYRENE ONCE IT ENTERS THE ENVIRONMENT

By NASSCO Technical Advisory Council Members Lynn Osborn, P.E. and Kaleel Rahaim

Styrene does not remain in its natural state as it enters the environment. Changes to the styrene molecule occur whether the styrene is in water or in air. When styrene is in air as used in an air/steam cured CIPP, it has a half-life of 7 to 16 hours. Half-life implies that in that amount of time one-half of the listed chemical will degrade to the next evolutionary product. Half-lives in water are quite variable depending on the nature of the stream, river or lake but generally significantly longer than in air. Styrene has a relatively low solubility in water, and a large fraction of the styrene released into water for a water-cured CIPP will volatilize into the atmosphere.[1] As a result, styrene generally does not persist in water because of its biodegradability and volatility.[2]

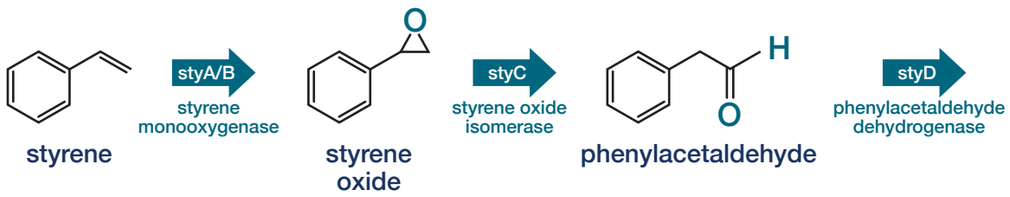
The photodegradation of styrene results in a TCA Cycle (Tricarboxylic Acid Cycle) as represented by the chart below.

The stable product of the photodegradation of styrene monomer is phenylacetic acid, an ingredient in many fragrances with a honey-like odor. It is a type of plant hormone that is found predominantly in fruits and is an insignificant risk to human health or the environment.

As we better understand styrene, we proceed with investigations in the lab and field to promote safety of workers and the public when CIPP is used to renew deteriorated pipes. The Trenchless Technology Center's (TTC's) Phase 2 Study found that of the many VOCs present in emissions on CIPP steam cure job sites, styrene was the only compound of interest found at concentrations that had the potential to pose health risks. There were two locations of concern on the job site, the exhaust manhole and the transport truck immediately after opening the doors. Safety procedures at the exhaust manhole are quite manageable, and recommendations were made in the Phase 2 Study and later in NASSCO's Guideline for the Safe Use and Handling of Styrene-Based Resins in Cured-in-Place Pipe (Styrene Guideline). However, the extent of emissions from the transport truck are not as well understood, and all that could be said at the time was to test for the level of styrene present upon opening the transport truck doors and to wear proper PPE understanding that air quality would improve as the transport truck box airs out.

This led to the Phase 3 study where TTC is investigating the breakthrough rate of styrene through various CIPP tube materials, particularly the thermoplastic coating on the outside of resin impregnated tubes. The idea is to be able to predict the concentration of styrene in the transport truck as a function of type of coating, surface area of coating, amount of resin, time in the truck and so on. Eventually testing will take place on transport trucks in use at operating CIPP wet-out facilities to confirm results of the laboratory studies.

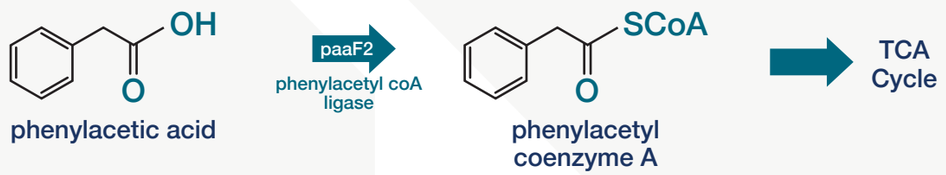
NASSCO's Health & Safety (H&S) Committee has led the way in better understanding how to measure styrene on job sites, which can be a difficult task and isn't always well understood. The H&S Committee is producing videos on how to properly measure styrene with various instruments, while also understanding the capabilities and limitations of the testing instruments available. They also plan to participate in a webinar on this subject. When TTC's Phase 3 Study is completed, the H&S Committee will again update NASSCO's Styrene Guideline to reflect any results and recommendations.



This is the third in a series of articles by NASSCO's Technical Advisory Council (TAC) discussing the health and safety aspects of styrene as used in cured-in-place pipe (CIPP). The first article focused on styrene emissions while the second article looked at using CIPP in sensitive environments. This article examines what happens to styrene once it enters the environment, and how we are moving forward with laboratory and field studies for further understanding of mitigation methods to better protect workers and the public.

[1]ToxGuide™ for Styrene, Agency for Toxic Substances and Disease Registry, September 2011

[2]Cohen, Joshua T., et al, 2002. A Comprehensive Evaluation of the Potential Health Risks Associated with Occupational and Environmental Exposure to Styrene. Journal of Toxicology and Environmental Health, vol. 5, no. 1-2.



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