



Pavement Sealant Leaches Environmental Contaminants

Taylor J. Glatke^{1,2}, Martha L. Chacón-Patiño², Sarajeen Saima Hoque³, Thomas E. Ennis⁴, Steven Greason⁵, Alan G. Marshall^{1,2}, Ryan P. Rodgers^{1,2}

1. Ion Cyclotron Resonance Program, National High Magnetic Field Laboratory 2. Department of Chemistry and Biochemistry, Florida State University 3. Department of Civil & Environmental Engineering, FAMU-FSU College of Engineering 4. Watershed Protection Department, City of Austin, TX 5. Sitelab Corporation

Funding Grants: G.S. Boebinger (NSF DMR-1644779)



Coal tar pavement sealant can protect roads and parking lots from degradation. However, these sealants are known to contain high concentrations of carcinogenic polycyclic aromatic hydrocarbons (PAHs). In this user collaboration, coal tar sealant was submerged in water and exposed to laboratory-simulated sunlight. The weathered sealant and water-soluble fraction were analyzed using ultrahigh-resolution Fourier Transform Ion Cyclotron Resonance Mass Spectrometry (FT-ICR MS). FT-ICR MS assigned tens of thousands of compounds in the weathered sealant and the water fractions.

The FT-ICR data find that coal tar pavement sealants are oxidized by sunlight into toxic water-soluble compounds (oxy-PAHs) that can pollute waterways. Water fractions were tested for toxicity, which revealed that coal tar sealant can transfer toxic compounds into groundwater and marine environments.

FT-ICR MS and toxicity testing provide evidence that coal tar-based sealants should be avoided. However, testing to determine toxic effects on humans requires additional research on human cell lines, research that is now underway in an ongoing collaboration with MIT.

Facilities and instrumentation used: 9.4 T, 220 mm Fourier Transform – Ion Cyclotron Resonance Mass Spectrometer, ICR facility
Citation: Glatke, T.; Chacon Patino, M.L.; Hoque, S.S.; Ennis, T.E.; Greason, S.; Marshall, A.G.; Rodgers, R.P., *Complex Mixture Analysis of Emerging Contaminants Generated from Coal Tar- and Petroleum-Derived Pavement Sealants: Molecular Compositions and Correlations with Toxicity Revealed by Fourier Transform Ion Cyclotron Resonance Mass Spectrometry*, Environmental Science and Technology (2022) doi.org/10.1021/acs.est.2c00582

