Pavement Sealant Leaches Environmental Contaminants

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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

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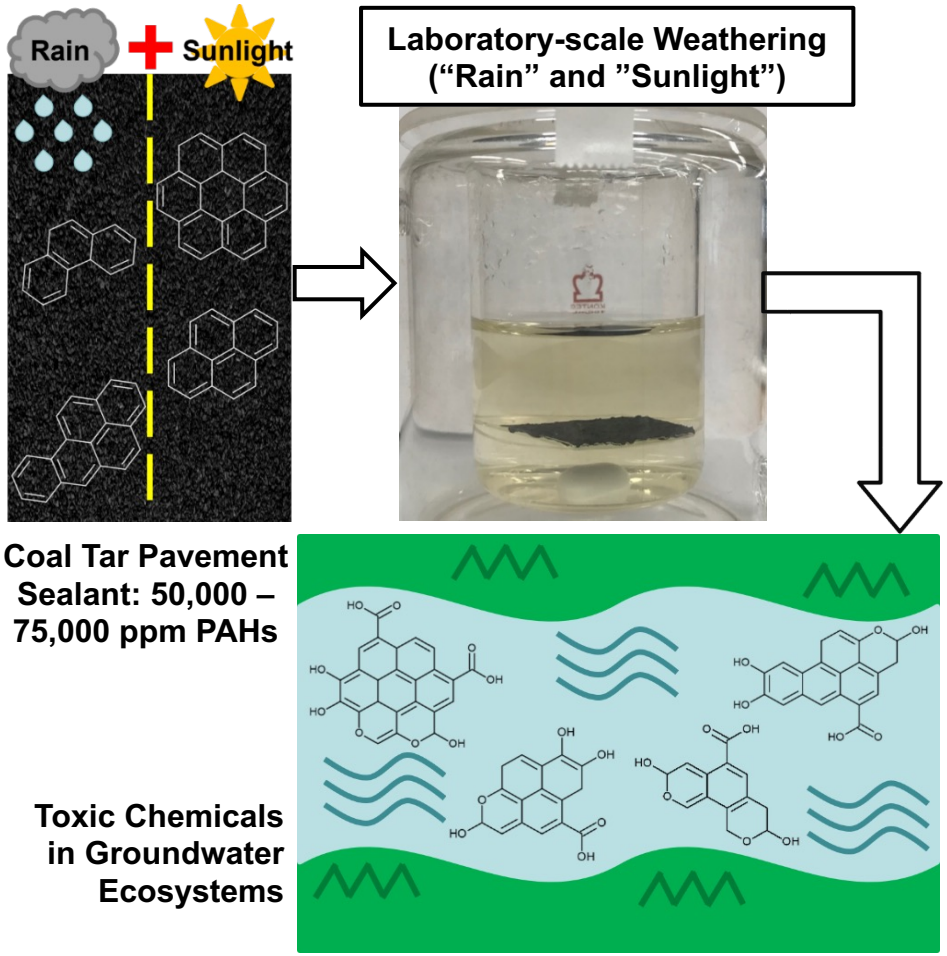

Coal tar pavement sealant contains 50,000 to 75,000 ppm of carcinogenic polycyclic aromatic hydrocarbons (PAHs). Weathering by sunlight and rain can contaminate natural waterways through oxidation of the PAHs contained in the pavement sealant. Image Credit: Taylor Glattke, MagLab