

*Supporting Information for*  
**Transformation and Release of Nanoparticle Additives & Byproducts from Commercially Available Surface Coatings on Pressure Treated Lumber**

Justin G. Clar<sup>Φ</sup>, William E. Platten III<sup>‡†</sup>, Eric Baumann<sup>‡</sup>, Andrew Remsen<sup>‡</sup>, Steve Harmon<sup>‡</sup>, Kim Rodgers<sup>‡</sup>, Treye Thomas<sup>‡</sup>, Joanna Matheson<sup>‡</sup>, Todd P. Luxton<sup>‡\*</sup>

<sup>Φ</sup>Elon University, Department of Chemistry, Elon NC 27244

<sup>‡</sup>National Risk Management Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, 5995 Center Hill Avenue, Cincinnati, OH 45224, USA

<sup>‡</sup>Pegasus Technical Services Inc, Cincinnati OH

<sup>‡</sup>National Health Effects and Exposure Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Research Triangle Park, NC

<sup>‡</sup>U.S. Consumer Product Safety Commission, Office of Hazard Identification and Reduction, 4330 East West Highway, Bethesda, MD 20814, USA

\*Luxton.Todd@epa.gov, (513) 569-7210

*Outdoor weathering* – After coating application, boards air dried indoors for a period of no less than 48 h and no more than 72 h. After drying, sub sections of the painted boards were placed outside at the U.S EPA Center Hill Research Facility in Cincinnati, OH to undergo natural weathering. Data on average monthly temperatures and precipitation were extracted from the National Weather Service, Observed Weather Data reports for Cincinnati, OH and presented in Table S1. Coated samples were allowed to weather on floating stands to ensure no ground contact while also allowing runoff to fall from the surface. Coated surfaces were sampled to estimate potential transfer through dermal contact using a modified CPSC Wipe Method shown in Figure S1.

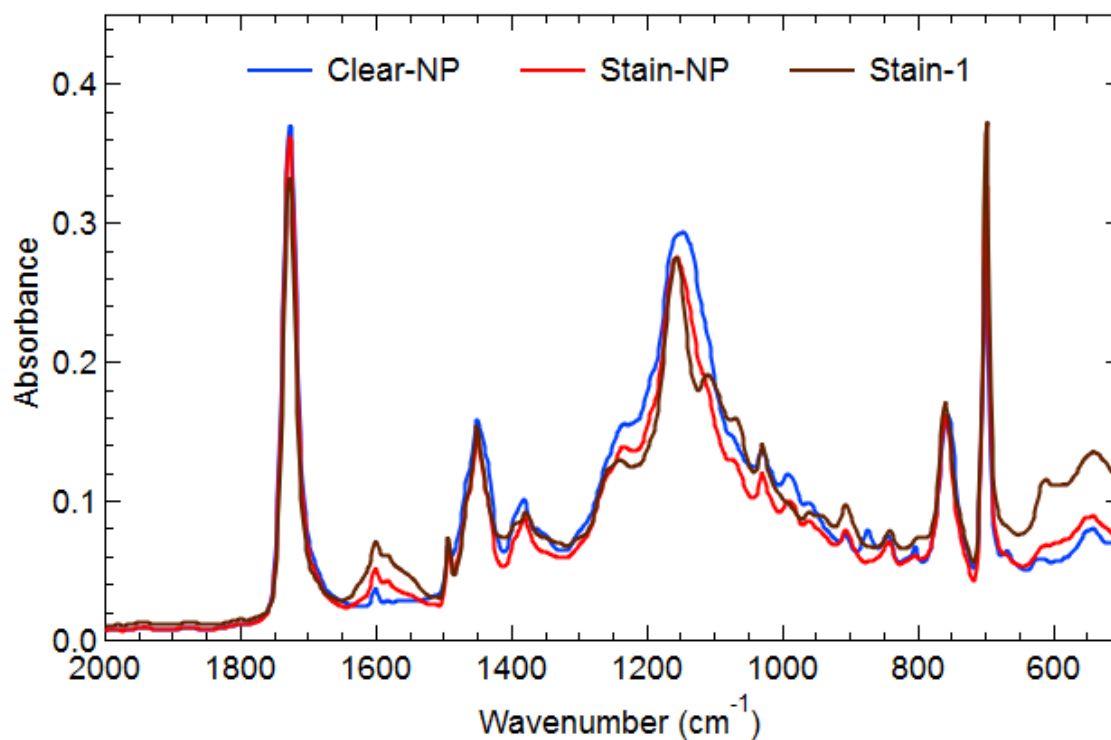
<i>Month (2016)</i>	<b>Temperature (°C)</b>			<b>Precipitation (cm)</b>	
	<i>Average High</i>	<i>Average Low</i>	<i>Average</i>	<i>Rain</i>	<i>Snowfall</i>
January	2.44	-5.72	-0.83	3.53	21.6
February	7.33	-2.55	2.39	13.3	21.3
March	15.0	5.11	10.0	13.5	5.8
April	18.94	6.61	12.77	12.4	T
May	22.1	52.1	11.16	7.11	0.0
June	29.55	17.39	23.44	6.32	0.0
July	35.61	19.8	25.0	12.85	0.0

\* T indicates Trace Amounts

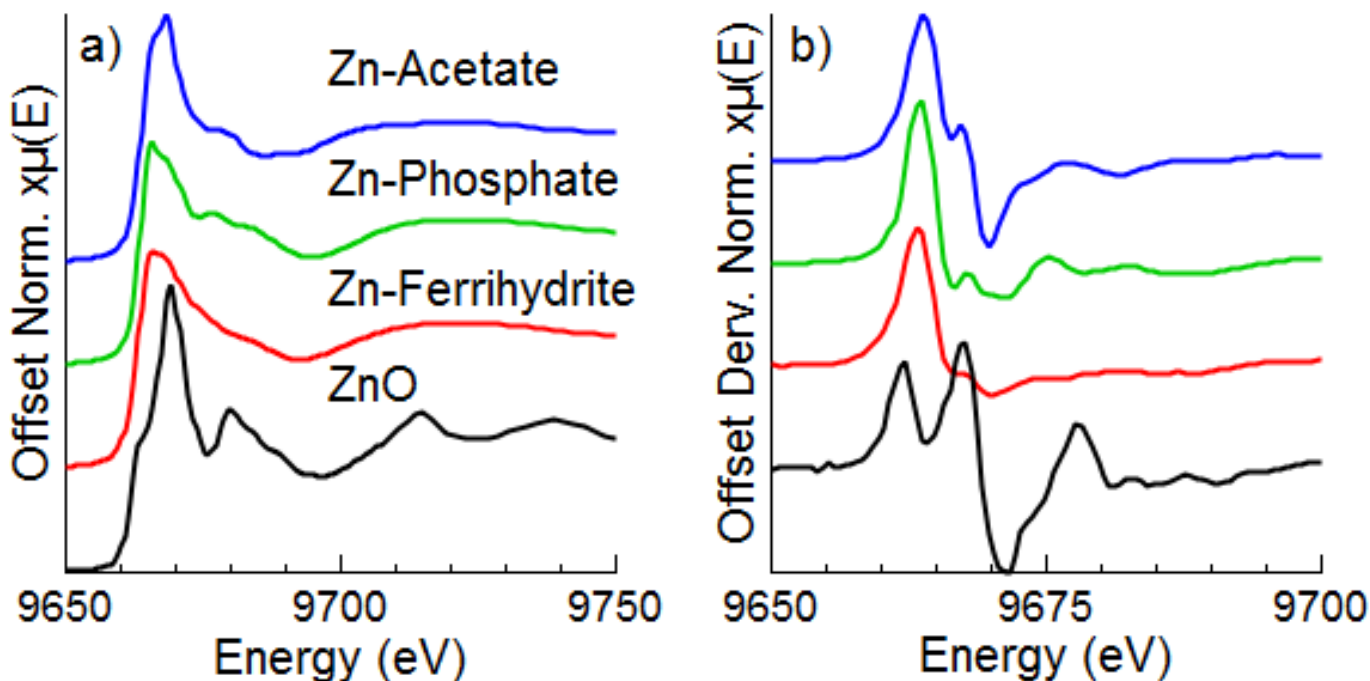
**Table S1:** Weather conditions in Cincinnati, OH at Center Hill Research Facility during outdoor weathering of surface coated samples.



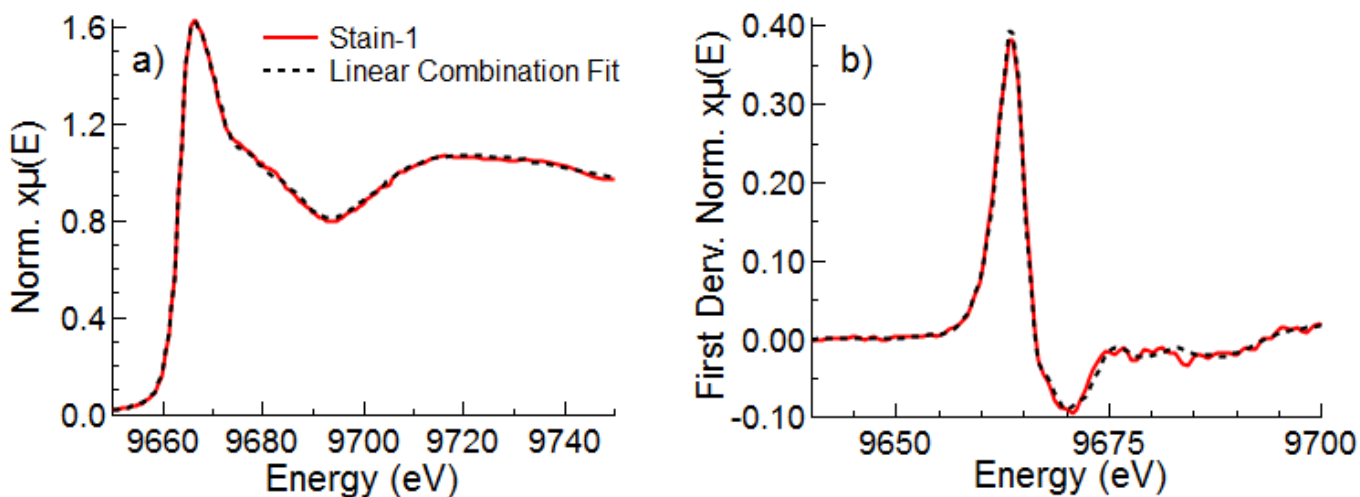
**Figure S1:** Wiping apparatus used in estimation of zinc and copper exposure through dermal contact. Apparatus was clapped to the board before sampling in the same location to ensure repeated sampling of the same surface over the prescribed time period. The aluminum disc (1.1 kg) was covered in a polyester fabric cloth and dragged over a distance of 50 cm. A wipe cycle constituted moving the weight back and forth 10 times, with the weight being rotated 90 degrees after the first 5 cycles.



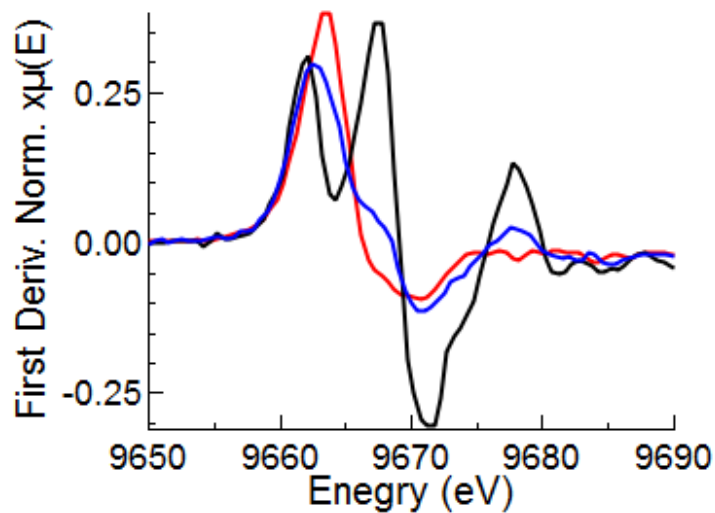
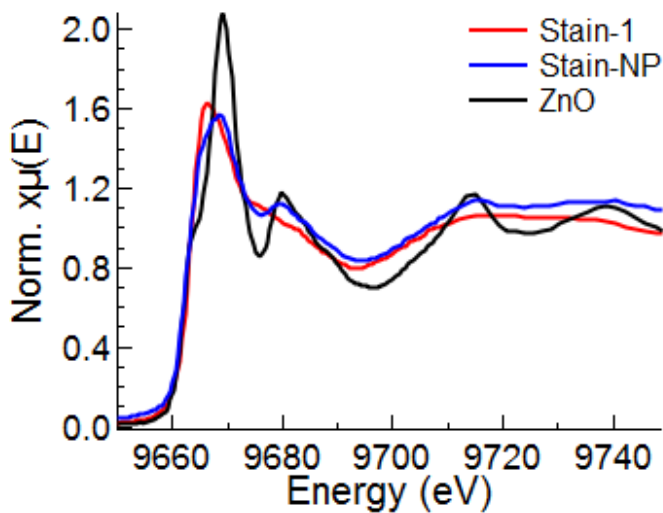
**Figure S2:** FT-IR spectra of coatings used in experimentation. Spectral features are similar for all products indicating a similar base composing of polymers and resins commonly found in coating products.



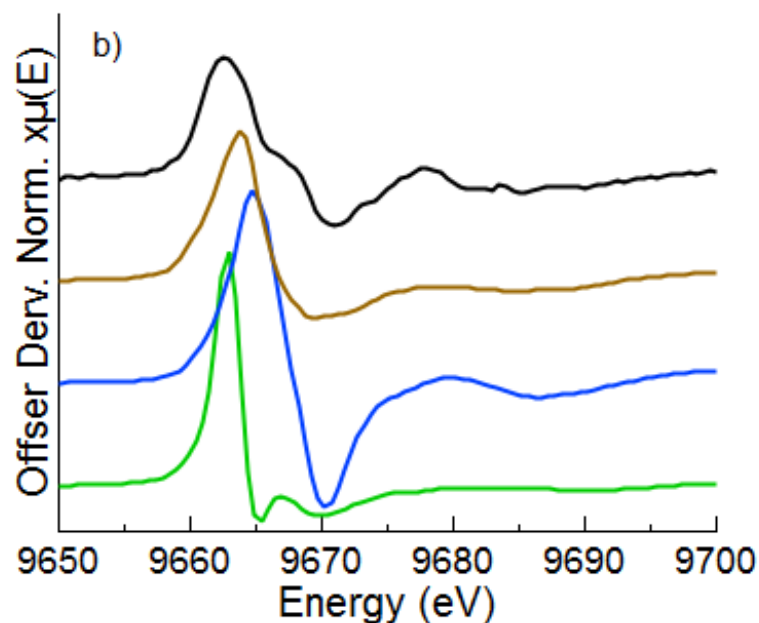
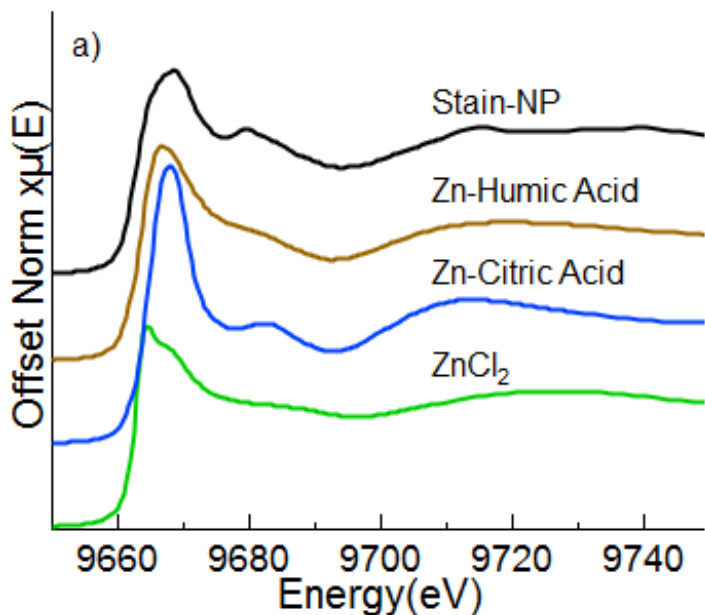
**Figure S3:** a) Normalized and b) First Derivative of normalized spectra of zinc standards used in LCF analysis of XAFS data to determine zinc speciation in coating products samples. Differences are evident in the spectral shape between ZnO crystalline phases or zinc-absorbed phases. Spectra have been offset for visual clarity.



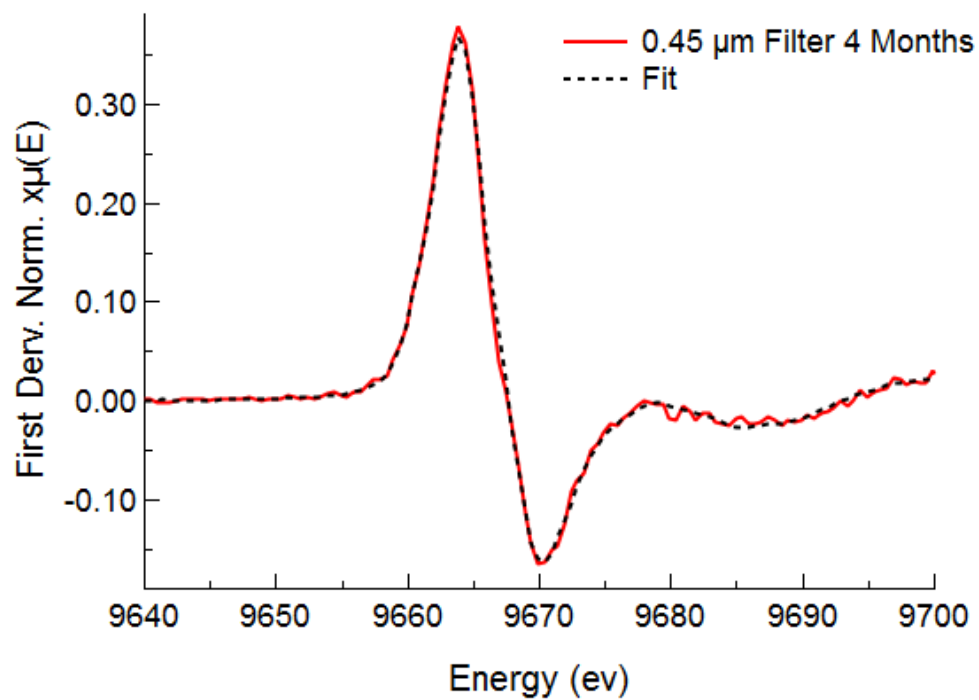
**Figure S4:** Example of LCF analysis completed on a dried sample of Stain-1. Results are shown on using both a) normalized spectra and b) first derivative of normalized spectra. LCF fit suggest a complex combination of zinc species distributed between organic complexes (12%), phosphates (33%), and zinc absorbed to iron minerals (55%).



**Figure S5:** Comparison of XAFS spectra for both Stain-1 (no NPs) and Stain-NP coatings. An external ZnO reference is included for comparison. Few differences are evident between the Stain-1 and Stain-NP formulations, with no obvious features of ZnO. Data is presented as both a) normalized, and b) first derivate spectra.



**Figure S6:** a) Normalized and b) First Derivative of normalized spectra of zinc standards used in LCF analysis of XAFS spectra collected from 0.45 $\mu$ m filters produced from simulated dermal contact using the CPSC wipe methodology. Clear differences are evident in the spectral shape between ZnO crystalline phases, ionic or zinc-absorbed phases. Spectra have been offset for visual clarity.



**Figure S7:** Example of LCF analysis completed on a 0.45 $\mu$ m filter collected during CPSC wipe analysis for simulated dermal contact. Results are presented as first derivative of normalized spectra.