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Effects of orthophosphate corrosion inhibitor on lead in blended water quality environments

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ABSTRACT

This study evaluated the effects of orthophosphate (OP) inhibitor addition on corrosion of lead/tin coupons exposed to different blends of groundwater, surface water, and desalinated seawater. Four different doses of OP inhibitor, from zero (control) to 2 mg/L as P, were investigated and non-linear empirical models were developed to predict lead release from water quality and OP doses. Surface characterization evaluations were conducted using X-ray Photoelectron Spectroscopy (XPS) for each lead coupon tested. A theoretical thermodynamic model was developed to predict lead. OP inhibitor addition was found to reduce lead release for the OP dosages evaluated and water blends evaluated compared to pH adjustment alone. Empirical models showed increased phosphorus and pH reduced lead release while increased alkalinity, chloride, and temperature contributed to lead release. Thermodynamic modeling suggested that hydroxypyromorphite is the controlling solid that forms on lead surfaces, regardless of blend, when OP inhibitor is added for corrosion control.

Keywords: Lead release; Orthophosphate corrosion inhibitor; Blended source water; Distribution system water quality

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