Effect of organic compounds on lead alloys corrosion in simulated soil solution

Karel Rapouch[1], Jiří Příhoda[1], Jiří Tulka[1]
[1]Department of chemistry, Faculty of science, Masaryk university, Kotlářská 2, Brno

Archaeological lead artifacts contain usually tin and antimony. These admixtures affect corrosion rate, because tin and antimony create intermetallic phase, which supports formation of galvanic microcells between this phase and lead matrix. Lead is sensitive to influence of organic acids. Soil contains simple organic acids (formic, acetic acid etc.) and organic acids with higher molecular mass – humic and fulvic acids. This study was focused on effect of fulvic acid, because it is soluble independently of pH and therefore is more aggressive. For electrochemical measurements of corrosion rate five working electrodes were prepared. Composition of the working electrode alloys was approximately 10 % of tin; 0,5 %–1 %–5 %–10 % –15 % of antimony, lead remaining. Simulation of corrosion environment was carried out in Ku'erle simulated soil solution. Formic, acetic and fulvic acids were added to basic electrolyte and their effect was compared. Study of corrosion rate was performed by potentiostatic linear polarization. Addition of organic acids shifted corrosion potential into anodic area and corrosion current increased. The addition of tin and antimony in alloys reduced corrosion rate in front of pure lead, but rising content of antimony increased corrosion rate of alloys in solutions with organic acids. The highest corrosion rate was measured in solution with addition of acetic acid. Fulvic acid in contrast to other organic acids was less aggressive, but it lowers considerably pH of solution.