Abstract

The aim of this study is to show the effect of two phosphonate surfactants (PS) on the electrochemical behavior of the negative plate of lead-acid battery in the sulfuric acid medium. The characterization of the electrode interface was investigated at room temperature by a set of electrochemical techniques as linear sweep voltammetry (LSV), cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS) and chronoamperometry (CA). Scanning electron microscopy (SEM) was employed to determine the film layer's morphology deposited on the surface of working electrodes, in the presence and in the absence of the PS. When the PS was added in the acidic solution, hydrogen evolution became higher, the over-potential of hydrogen was shifted to negatives values and the growth of the anodic β-PbO2 was inhibited. SEM imaging with the presence of PS showed reduction in the growth of the anodic β-PbO2 and PbSO4 layers. EIS results indicate the decrease of the conductivity of β-PbO2 film on the lead surface electrode. The result of the CV, show a decrease in the peak related to transition of PbO to Pb demonstrates that lower PbO has been formed underneath the lead sulfate membrane in the presence of low concentration of SP indeed a decrease in the amount of formed PbSO4 on the electrode surface.