Inhibition performances of three imidazolium based ionic liquids for Tin in the alkali solution

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Abstract With the development of electronic devices, printed circuit board technology has become increasingly important. At present, the printed circuit board process is basically complete, and the commonly used developer in the printed circuit board process is alkaline solutions such as tetramethylammonium hydroxide (TMAH), sodium carbonate, potassium hydroxide, etc., which are used to wash away acidic photoresist. The conductive material used in some printed boards is usually metallic tin, which has both sexes. When using alkaline solution for cleaning, it will cause corrosion to the tin metal, and have an impact on the printed board workpiece. Therefore, it is particularly important to develop a corrosion inhibitor that can inhibit the corrosion of tin metal in alkaline environments, which can reduce tin loss and improve the yield rate for printed circuit board processes. This study investigated three imidazole based ionic liquids ($C_8H_{15}BF_4N_2$, $C_9H_{15}N_3S$, $C_8H_{15}F_6N_2P$) and evaluated their corrosion inhibition performance on tin metal in alkaline environments by using electrochemical testing methods. At 1600ppm concentration and 313 K, the corrosion inhibition efficiency of inhibitors($C_9H_{15}N_3S$, $C_8H_{15}BF_4N_2$, $C_8H_{15}F_6N_2P$) for Sn in 4 % NaOH environment were 79.84%、80.27%、82.51%, respectively. The adsorption of three ionic liquids followed the Langmuir adsorption isotherm, ΔG_{ads} values were between -40 kJ/mol and -20 kJ/mol, indicating that the adsorption types of three ionic liquids were mixed with the chemical adsorption and physical adsorption Polarization studies shown that the ionic liquids were all mixed corrosion inhibitors. A series of characterization tests, including CA measurement, AFM, and SEM, were conducted to study the surface morphology of metals, and the results were consistent with the performance evaluation experiments.

Keywords: corrosion inhibitor; tin; alkaline environment;Ionic liquids; electrochemical testing