Electrodeposition of Zinc from Binary ZnCl$_2$-DMSO$_2$ Molten Electrolyte at Room Temperature

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The electrochemical behaviour of zinc on copper, platinum, and tungsten working electrodes was investigated in a binary ZnCl$_2$-DMSO$_2$ room temperature molten salt electrolyte in the temperature range of 60–80 °C. Various over-potentials, $-0.1$, $-0.2$, $-0.3$, $-0.4$, and $-0.5$ V, were chosen as deposition potentials. The nucleation/growth of zinc changed from progressive to instantaneous if the over-potentials increased from low to high level. The surface morphology and crystal structure of the deposited layer were investigated using scanning electron microscopy (SEM) and X-ray diffraction (XRD). Moreover, larger grain size and hexagonal close packing of the zinc layer at $-0.5$ V were observed by transmission electron microscopy (TEM) with electron diffraction mapping.

Key words: Room Temperature Molten Salt; ZnCl$_2$-DMSO$_2$ Electrolyte; Progressive Nucleation; Instantaneous Nucleation.