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在二甲亚砜中La-Ni-Co合金膜的电化学制备

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摘要: 研究了二甲亚砜(DMSO)中 La^{3+} 和 Ni^{2+} 在Pt, Cu和Ni电极上的电化学行为。结果表明, Ni^{2+} 在Pt电极上一步不可逆还原为Ni(0), La^{3+} 在Pt电极上表现为准可逆电极过程。在298 K时, 利用循环伏安法测定 $0.01 \text{ mol} \cdot \text{L}^{-1} \text{ NiCl}_2$ $0.1 \text{ mol} \cdot \text{L}^{-1} \text{ LiCl}$ DMSO溶液中 Ni^{2+} 的扩散系数、传递系数分别为 $3.6 \times 10^{-6} \text{ cm}^2 \cdot \text{s}^{-1}$ 和0.16; 利用计时电流法测定 $0.01 \text{ mol} \cdot \text{L}^{-1} \text{ LaCl}_3$ $0.1 \text{ mol} \cdot \text{L}^{-1} \text{ LiCl}$ DMSO溶液中 La^{3+} 的扩散系数为 $3.1 \times 10^{-6} \text{ cm}^2 \cdot \text{s}^{-1}$ 。在铜电极上于-2.250~-2.650 V (vs SCE)下恒电位电解, 可获得粘附性好、有金属光泽的La-Ni-Co合金均匀沉积膜, 其中La的含量可达10.19%~24.10%。在铜电极上于0.5~0.8 A·dm⁻²下恒电流电解, 同样可获得粘附性较好、呈深黑色的La-Ni-Co合金均匀沉积膜。

关键字: 镧; 电沉积; DMSO; La-Ni-Co合金; 扩散系数; 传递系数

Electrochemical preparation of La-Ni-Co alloy films in DMSO

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Abstract: The cyclic voltmetry and potential step methods were used to investigate the electrochemical behavior of Ni^{2+} and La^{3+} in NiCl_2 LiCl DMSO and LaCl_3 LiCl DMSO systems on Pt, Cu and Ni cathodes. Experimental results indicate that the electroreduction of Ni^{2+} to Ni is irreversible in one step, the electroreduction of La^{3+} to La is quasi reversible. The diffusion coefficient of La^{3+} in LaCl_3 LiCl DMSO system at 298 K was $3.1 \times 10^{-6} \text{ cm}^2 \cdot \text{s}^{-1}$. The diffusion coefficient and transfer coefficient of Ni^{2+} in NiCl_2 LiCl DMSO system at 298 K were $3.6 \times 10^{-6} \text{ cm}^2 \cdot \text{s}^{-1}$ and 0.16, respectively. Potentiostatic and current constant electrolysis were used to prepare La-Ni-Co alloy films. La-Ni-Co alloy films containing La from 10.19% to 24.10% were prepared by potentiostatic electrolysis on Cu substrate at deposition potential from -2.250 V to -2.650 V (vs SCE). Their surfaces were smooth, adhesive, uniform and metallic.

luster. It is believed that potentiostatic electrolysis is superior to current constant electrolysis.

Key words: lanthanum; electrodeposition; DMSO; La Ni Co alloy films; diffusion coefficient; transfer coefficient

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