The effects of Zn^{2+} and Polyacrylamide (PAM) on the Electrodeposition of Manganese from Non-Selenium Sulfate Solutions

Fan Zheng¹, Yan Li¹, Dihua Wang¹, Jinlin Li², Hua Zhu^{1,*}

¹ School of Resources and Environmental Science, Wuhan University, Wuhan 430079, People's Republic of China

² College of Chemistry and Material Science, South-Central University for Nationalities, Wuhan 430074, People's Republic of China

*E-mail: zhuhua@whu.edu.cn

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In the present paper, the additives of Zn^{2+} and polyacrylamide (PAM) were used to increase the cathodic current efficiency and improve the morphology of deposits. The effects of Zn^{2+} and polyacrylamide (PAM) on the electrodeposition of manganese from non-selenium solutions were investigated by cyclic voltammetry. The morphology and structure of the deposited metal obtained by galvanostatic electrolysis was determined by scanning electron microscope (SEM) and X-ray diffraction (XRD), and the purity was determined by X-ray fluorescence (XRF) spectrometry. The results indicated that Zn^{2+} could increase the current efficiency by 2% when $2 \text{ mg} \cdot \text{L}^{-1} \text{ Zn}^{2+}$ was added, but it could not improve the morphology of the deposited metal. On the contrary, the incorporation of PAM slightly decreased the current efficiency, but it was demonstrated dramatic leveling and refining effects on the morphology of the cathodic deposits by promoting nuclei formation. The combination of Zn^{2+} and PAM exerted a beneficial effect on manganese deposition for long-term electrolysis, meanwhile, the manganese purity could reach up to 99.90%.

Keywords: Additive; Electrodeposition; Manganese; Current efficiency; Deposit Morphology

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