Pb(II) Effect on Electrosynthesis of Lead Dioxide in Alkaline Solution

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An electrochemical investigation focused on electrosynthesis of lead dioxide in alkaline solutions, using rotating disk electrode (RDE) and rotating ring disk electrode (RRDE), has been carried out. The experiments show that Pb(II) haven’t modified the evolution of oxygen in alkaline solutions, and the reaction taking place at 0.6 V_sce is under the mixed control of ionic transport and charge transfer. Koutechy-Levich equation has been used to calculate the value of diffusion coefficient D and apparent heterogeneous rate constant k of Pb(II) oxidation reaction at 0.6 V_sce. The calculation results indicate that Pb(II) itself has the negative influence on the diffusion of Pb(II). In addition, Pb(II) has the positive influence on the apparent heterogeneous rate constant of PbO₂ electrodeposition process. The intermediate was discovered in PbO₂ electrodeposition process using RRDE. XRD and SEM were employed to investigate the phase composition and surface microstructure of the synthesized deposit. The result confirms that PbO₂ synthesized in an alkaline solution consists of pure α phase, but not all characteristic peaks are present and relative intensities are not in agreement with the ICDD card. The deposit shows the preferential orientation of growth in the (200) crystallographic plane, and the deposit is compact and uniform which is composed of rounded nanocrystallites.

Keywords: lead dioxide; alkaline solution; Pb(II) concentration; RDE; RRDE

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