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# Influence of Alloy Element Addition on the Nucleation Mechanism of the Lead Alloy Surface and its Oxide Film Properties

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**Abstract:** Oxidation film growth is an inextricable part of the nucleation mechanism at the initial stage of oxidation on the lead anode surface, which results from different degrees of corrosion resistance. In this paper, Pb, Pb-Sn-Ag, Pb-Ca, and Pb-Ca-Sr alloys were taken as raw materials to study the element doping effect on the nucleation growth mode of the oxide film on the lead alloy surface using  $\text{CrO}_3$  solution as an electrolyte. The results show that four kinds of alloy anodes behave in accordance with the Bewick 2D nucleation growth method during the oxidation process, while there are differences among anodes. Nucleation is remarkably related to the internal stress and structure of the lead alloy substrate; internal stress significantly influences the electrochemical properties of oxidation film. The oxidation film generated on the Pb-Sn-Ag alloy anodes is found to have a better corrosion resistance than those on the other anodes by means of electrochemical testing, as the lead anode features small internal stress and nucleates in a gentle manner, its thickness is the smallest as well.

Keywords: alloy element, lead anodes, internal stress, nucleation mechanism.

## 1. Introduction

The effective application of insoluble anodes is one of the differences between chromium plating and general mono metal electroplating. In the traditional process,

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