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## Influence of additives selected calix[4]arenes on electroless copper plating using hypophosphite as reducing agent

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### Abstract

The effect of a new calix[4]arenes additives, namely Tetra methyl ester-P-tertbutyl calix[4]arene (Calix1), Tetra acid-P-tertbutyl calix[4]arene (Calix2) and Tetra methyl ester-P-tertbutyl thicalix[4]arene (Calix3), on deposition rate, deposit composition, structure and morphology of electroless copper plating was investigated. It is found that the additives addition decreased remarkably the deposition rate from 27.6  $\mu\text{m/h}$  to 14  $\mu\text{m/h}$  with a change of the crystallization process of copper. It is also shown the coating is adherent and compact deposit and the bath became more stable. Indeed, the SEM studies revealed that the additives modified the surface morphology of the copper deposits and depended on their molecular structures. In the other, the XRD pattern revealed peaks intensified orientation {111} plane in the presence of Calix3, which its structure content sulfur atom, indicating that the obtained deposit has good electrical properties. Finally, the cyclic voltammetry and electrochemical impedance spectroscopy studies revealed that the additives are adsorbed at the electrode surface and decreased the deposition rate such as obtained by gravimetric measurements.

**Keywords:** Electroless copper plating; Calix[4]arenes additives; Electrochemical measurements.

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### 1. Introduction

Electroless copper deposition is large used for metallic copper layer formation on plastics and other dielectrics, semiconductors and other materials for the production of printed and integrated circuits, etc.[1–5]. Actually, copper offers low specific resistance and high resistance to electromigration [6, 7].

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