

# SEMICONDUCTOR ELECTROCHEMISTRY APPROACH TO PASSIVITY AND STRESS CORROSION CRACKING SUSCEPTIBILITY OF STAINLESS STEELS

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## Abstract

The susceptibility of AISI 304 type stainless steel to stress corrosion cracking (SCC) in boiling concentrated boric acid-chloride aqueous solutions, appears closely linked to the formation of a chromium rich passive oxide film presenting a p-type semiconductivity. Furthermore, the flat band potential of the oxide, which separates potential regions of predominant ionic conduction from regions of predominant electronic conduction, can be considered a critical potential. A band structure model is proposed, in which the initiation of the SCC phenomenon can be described as being the consequence of a localised change of the semiconductivity properties of the passive film, promoted by dislocations, in the potential region situated near the flat band potential. Also a short discussion is presented focusing on the relation between the SCC and the corrosion potential and the electronic structure of the passive film.