특별강연

Kinetics of Oxidation on Nickel, Iron, Aluminum and Steels at Low Tempererures

저온에서 니켈, 철, 알루미늄, 강의 산화반응에 대한 속도론적 연구

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This lecture summarises recent works on kinetics of oxidation on nickel, iron, aluminum and steels at low temperatures investigated by the author with his co-workers. A new model has been developed describing the movement of a metal cation vacancy through the passivating oxide film under the presence of an electric field which contributes to the film growth kinetics. The present model accounts for the formation of metal and oxygen vacancies at the oxide film/electrolyte interface. The calculated values of current density and film thickness for the passivating films on iron and nickel are in accordance with those values obtained experimentally. The initial stage of anodic oxidation on the bare surface has been analyzed with mechanical film removal technique such as abrading electrode techniques. The working principle abrading electrode techniques is briefly introduced. Repassivation kinetics of such passivating metals as nickel, iron, aluminum and steels are successfully investigated using abrading electrode technique by the analysis of potentiostatic current transient obtained from the moment just after interrupting the abrading action on the specimens as functions of applied potential and chloride ion concentration. For the analysis of current transient experimentally measured in the early stage of film formation, the repassivation rate parameter which is the slope in the linear region of the current transient in logarithmic scale is suggested. Generally, kinetics of oxidation on such passivating metals as nickel, iron, aluminum and steels are discussed in terms of change in repassivation rate parameter of oxide film formed in the early stage of film formation.

Reference

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